

Commonwealth of Pennsylvania

REPORT

OF THE

DEPARTMENT OF FORESTRY

OF THE

STATE OF PENNSYLVANIA

FOR THE

YEARS 1912-1913

HARRISBURG, PA.:
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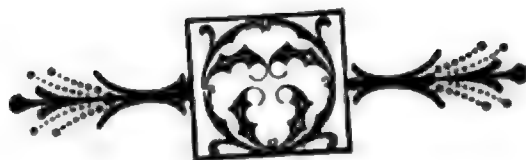
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PENNSYLVANIA
DEPARTMENT OF FORESTRY.

OFFICIAL LIST.

THE STATE FORESTRY RESERVATION COMMISSION.

Robert S. Conklin, President, Columbia, Lancaster county.

Dr. J. T. Rothrock, Secretary, West Chester, Chester county.

Miss Mira L. Dock,* Harrisburg, Dauphin county.

S. B. Elliott, Reynoldsville, Jefferson county.

J. Linn Harris, Bellefonte, Centre county.

Frank L. Harvey,§ Foxburg, Clarion county.

OFFICE OF THE COMMISSIONER OF FORESTRY.

Commissioner of Forestry, Robert S. Conklin, Columbia, Lancaster county.

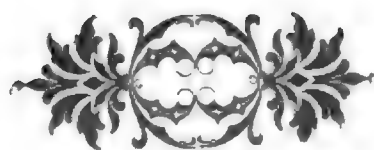
Deputy Commissioner of Forestry, Irvin C. Williams, Esq., Royersford, Montgomery county.

Clerk, A. Elwyn Strode, West Chester, Chester county.

Clerk, George W. Howard, Chester, Delaware county.

*Commission expired July 25, 1913, and declined reappointment.

§Appointed October 10, 1913, to fill the vacancy caused by the retirement of Miss Dock.



LETTER OF TRANSMITTAL.

HON. JOHN K. TENER, Governor:

Sir: I have the honor to present herewith the report of the Department of Forestry covering the years 1912 and 1913. I wish particularly to draw your attention to the financial report showing the returns from the State Forests as indicating that these lands now held by the State are a great investment and will respond in the future with revenue of greater or less amount as they are permitted to be developed in the present.

I am, indeed,

Most respectfully yours,

ROBERT S. CONKLIN,
Commissioner of Forestry.

Harrisburg, Pa., December 31, 1913.



COMMONWEALTH OF PENNSYLVANIA

REPORT OF THE COMMISSIONER OF FORESTRY FOR THE
YEARS 1912-1913.

On January 1, 1912, the area of the State forests was 966,229 acres, 57.85 perches. There was a loss of 66 acres, 65.99 perches incurred by reason of defective tax titles. During the year 1912 an addition of 16,023 acres, 51 perches was made to this holding, and 11,776 acres, 72 perches were added during the year 1913, thus bringing the area of the State forests on January 1, 1914, to 994,029 acres, 20.85 perches.

No new State forests were created during the period covered by this report. All purchases were additions to existing forests. The State lands are located in the following counties: Adams, Bedford, Cameron, Centre, Clearfield, Clinton, Cumberland, Dauphin, Elk, Franklin, Fulton, Huntingdon, Juniata, Lackawanna, Lycoming, Mifflin, Monroe, Perry, Pike, Potter, Snyder, Somerset, Tioga, Union, Westmoreland, and Wyoming.

A detailed statement of the purchases covering the years 1912 and 1913, follows:

1912. Grantor.	County.	Acres.	Per.	Total amount.
Central Penna. Lumber Co.,	Tioga,	1,831	112	\$4,579 25
Ella A. Montgomery,	Lackawanna,	92	.....	345 00
E. B. Young,	Tioga,	106	.....	185 50
Exrs. Est. Wm. McMurtry, Decd., & Frances McMurtry,	Lackawanna,	1,325	55	2,650 69
Thomas R. Harter,	Clinton,	1,159	7	2,897 61
F. B. Watrous,	Lycoming,	1,039	70	2,338 74
Tide Water Pipe Line Co.,	Lycoming,	60	.....	.....
Frank L. Oppel,	Huntingdon,	169	85	423 83
D. W. Smithgall,	Lycoming,	577	123	1,155 54
Lizzie A. Fetterolf & J. M. Mattern, Guardian,	Snyder,	97	146	293 74
Central Penna. Lumber Co.,	Lycoming,	330	.....	742 50
David Sheaffer & Mamie Florence Burkett,	Perry,	59	68	193 13
Jennie Carson,	Perry,	7	.....	35 00
Emma B. Childs,	Lycoming,	75	13	150 16
Margaret A. Jordan,	Pike,	51	140	.....
Annie Clinton,	Clinton-Potter,	50	.....	62 50
Luther L. Weaver,	Potter,	50	.....	125 00
James C. Quiggle,	Centre,	37	.....	64 11
Thomas B. Allen & Edmund B. Tuton,	Clinton,	50	.....	140 00
Asher D. Updegraff & Chas. Bartles,	Clinton,	900	.....	1,200 00
George Louis Dormoy,	Lycoming,	359	.....	855 40
Ivan E. Butler,	Monroe,	1	86	7 69
Ernest O. & Julia B. Blackwell,	Tioga,	27	108	83 03
David Libby,	Tioga,	103	.....	180 25
C. LaRue & Robt. H. Munson, Mineral Reserve on 5,761 acres, 17 perches @ 25c per acre,	Union,	141	5	222 06
South Mountain Mining & Iron Co.,	Clinton, .....	.....	.....	1,437 78
A. A. Bennett,	Adams-Cumberland,	6,393	144	27,973 60
Wm. J. Wiest, Trustee,	Potter,	41	.....	102 50
	Union,	411	.....	1,335 75
Total,		16,023	51	\$49,782 36

1913. Grantor.	County.	Acres.	Per.	Total amount.
East Penn Lumber Company,	Monroe,	1	159	.....
J. R. & R. A. Kress,	Lycoming,	219	46	\$328 88
Wm. P. Mitchell, Agent, Lackawanna Lumber Co.,	Clinton,	973	26	2,189 62
Maude L. Gifford,	Huntingdon,	554	142	2,219 70
Maude L. Gifford,	Huntingdon,	48	120	.....
South Mountain Mining & Iron Company,	Adams,	1,435	171	.....
.....	Cumberland,	826	95	9,249 80
South Mountain Mining & Iron Company,	Adams,	332	102	.....
.....	Cumberland,	7,124	21	29,827 15
South Mountain Mining & Iron Company,	Cumberland,	106	24	424 60
Wm. Whitmer & Sons Co.,	Union,	102	157	277 45
Total, .....	.....	11,776	72	\$44,497 20

From the above tables it will be seen that during the period covered by this report 27,799 acres and 123 perches were added to the State's holdings bringing the aggregate to date to 994,029 acres, 20.85 perches. At present there are under contract for purchase 8,000 acres, an area which is practically certain to be acquired, and when conveyed will increase the State's holdings to more than a million acres of land. The million acre mark, therefore, has practically been reached. A fair question arises respecting future purchases. Is there sufficient land in hand to work out Pennsylvania's forest problems or is the present area insufficient?

When it is considered that one-third of the surface of the Commonwealth is land of such character that it is suitable only for growing trees and that this means an area of something over eight million acres, it will be seen that the Commonwealth at this time is in practical possession of about one-eighth of the permanently forested area of the State, lying in twenty-six counties only. Forest holdings should be acquired in at least twenty-two additional counties. The following counties are possessed of large areas of land well adapted for State forest purposes: Warren, McKean, Forest, Venango, Jefferson, Indiana, Cambria, Blair, Fayette, York, Lebanon, Berks, Lehigh, Schuylkill, Northumberland, Columbia, Carbon, Wayne, Bradford, Susquehanna, Luzerne, and Sullivan. It will thus be seen that a proper distribution of State forests will involve the purchase of considerable areas in the twenty-two counties named, and these might well represent the holding of another million acres. Indeed it is not too much to say that the best interests of the Commonwealth would be met and subserved if the forest holdings of the State under intensive State management could be trebled. Purchases should be made while the land may be had at a reasonable price.

THE PENNSYLVANIA STATE FORESTERS.

On September 1, 1912, six new foresters were assigned to definite stations, and on September 1, 1913, eleven additional foresters received their appointments. These young men comprised the classes of 1912 and 1913 from the Forest Academy, having completed their three years' course. Under the terms of their contract with the Department, three years' additional service is required of them. The place and date of their assignments by the Commissioner of Forestry, are as follows:

W. B. Evans, Sinnemahoning Forest, Sizerville Division, headquarters at Sizerville. September 1, 1912.

Joseph R. Hogentogler, McElhattan Forest, headquarters at Rosecrans. September 1, 1912.

Charles R. Meek, Seven Mountain Forest, Poe Division; headquarters at Spring Mills. September 1, 1912. Transferred to the Coburn Division of this Forest, with headquarters at Coburn, March 1, 1913.

Maurice Mustin, South Mountain Forest, Caledonia Division; headquarters at Fayetteville. September 1, 1912. Transferred to Division of Surveys, Harrisburg, January 1, 1913.

J. B. Ryon, Whetham Forest, headquarters at Glen Union. September 1, 1912.

George W. Sheeler, Hopkins Forest, Snow Shoe Division, headquarters at Snow Shoe, September 1, 1912.

N. B. Funk, Hopkins Forest, Keating Division, with headquarters at Westport. September 1, 1912. Transferred to Crossfork Division of the Kettle Creek Forest as assistant forester, April 1, 1913. Resigned October 1, 1913.

James A. Irvin, Sinnemahoning Forest, Medix Division, with headquarters at Medix Run. September 1, 1912. Resigned October 1, 1913.

Milton O. Robinson, Minisink Forest, Promised Land Division, with headquarters at Canadensis. September 1, 1912. Resigned October 1, 1913.

Horace F. Critchley, Minisink Forest, Hunters Range Division, headquarters at East Stroudsburg. September 1, 1913.

V. M. Bealer, Stuart Forest, headquarters, at Ligonier. September 1, 1913.

Jesse M. Houtz, Nittany Forest; headquarters at Bellefonte, R. D. No. 3. September 1, 1913.

W. Erdman Montgomery, Seven Mountain Forest, Poe Division, headquarters at Spring Mills, R. D. No. 3. September 1, 1913.

Max E. Müller, Kettle Creek State Forest, Leidy Division, headquarters at Hammersleyfork. September 1, 1913.

Robert R. Neefe, Black Forest; headquarters at Slate Run. September 1, 1913.

George S. Perry, Sinnemahoning Forest, Hull Division; headquarters at Conrad. September 1, 1913.

Charles E. Zerby, Sinnemahoning Forest, Medix Division; headquarters at Medix Run. September 1, 1913.

B. Bryson McCool, South Mountain Forest, Caledonia Division; headquarters at Fayetteville. September 1, 1913.

John R. Elder, Seven Mountain Forest, Jacks Mountain Division; headquarters at Troxelville. September 1, 1913.

Thomas H. Golden, Kettle Creek Forest, Crossfork Division; headquarters at Crossfork. September 1, 1913.

Changes in locations of foresters appointed previous to 1912:

Tom O. Bietsch, transferred from the Mont Alto Nursery to the Greenwood Nursery, September 1, 1912; headquarters McAlevysfort, Huntingdon county, R. D. No. 1.

W. Gardiner Conklin, transferred from Seven Mountain Forest, Jacks Mountain Division, to Harrisburg, January 1, 1913.

Forrest H. Dutlinger, transferred from Whetham Forest to Hopkins Forest, Renovo Division, April 1, 1912; headquarters Westport.

A. C. Silvius, transferred from Sinnemahoning Forest, Austin Division, to White Deer Forest, Buffalo Division, April 1, 1912; headquarters Laurelton.

W. Elmer Houpt, transferred from South Mountain Forest, Cumberland Division, to Trough Creek Forest, July 23, 1912; headquarters Aitch.

Harry J. Mueller, transferred from White Deer Forest, Buffalo Division, to Nittany Forest, April 1, 1912; headquarters Bellefonte, R. D. Resigned October 1, 1913.

George A. Retan, transferred from the Greenwood Nursery in Huntingdon county, to the Mont Alto Nursery in Franklin county, September 1, 1912.

John W. Seltzer, Coburn, Centre county, leave of absence for two years from February 28, 1913.

Harry A. Thomson, transferred from Hopkins Forest, Renovo Division, to Black Forest, April 1, 1912; headquarters Slate Run. Resigned October 1, 1913.

John R. Williams, transferred from Stuart Forest to South Mountain Forest, Pine Grove Division, April 1, 1913; headquarters Pine Grove Furnace.

Clement C. Miner, Middlebury Centre, Tioga county. Resigned October 1, 1913.

H. Lawrence Vail, Conrad, Potter County. Resigned October 1, 1913.

P. Hartman Fox, transferred from Division of Surveys, Harrisburg, to Sinnemahoning Forest, Austin Division, April 1, 1912; headquarters Austin.

John L. MacAvoy, transferred from the Pennypacker Forest to the Kettle Creek Forest, Leidy Division, April 1, 1912, with headquarters at Hammersleyfork; transferred to the Stuart Forest March 1, 1913, with headquarters at Ligonier. Resigned October 1, 1913.

Walter M. Mumma, transferred from the Kettle Creek Forest, Leidy Division, to the Whetham Forest, April 1, 1912, with headquarters at Glen Union; transferred from the Whetham Forest to the Young Woman's Creek Forest, September 14, 1912, with headquarters at North Bend.

Edgar H. Smith, transferred from the Division of Surveys to the Bald Eagle Forest, April 1, 1912, with headquarters at Elimsport.

James E. McNeal, reinstated March 1, 1912, and assigned to the Division of Surveys.

I. T. Worthley, instructor at the State Forest Academy, resigned August 31, 1912.

THE PENNSYLVANIA FOREST RANGERS. New appointments during 1912 and 1913.

Forest.	Division.	Name of Ranger.	Badge number.	Forester.	Appointed.
Sinnemahoning,	Austin,	C. M. Head,	209	Fox,	10/9/12
Bedford, .....	.....	John Ott (a), .....	.....	Byers,	8/1/12
Bedford, .....	.....	Coyle H. Tewell (b),	191	Byers,	2/1/13
Bedford, .....	.....	E. H. Smith,	203	Byers,	3/1/12
Black Forest, .....	.....	Peter Raemore (c),	194	Thomson,	3/5/12
Black Forest, .....	.....	C. D. Will,	200	Thomson,	9/1/12
Black Forest, .....	.....	M. L. Fish,	210	Keller,	9/1/12
Buchanan,	Blackwells,	J. F. Smith,	165	Rupp,	4/1/13
White Deer, .....	.....	John L. Rutherford, (d),	198	Silvius,	9/1/12
Stone,	Buffalo,	Geo. A. Stebbins (e),	193	Miner,	7/1/12
Kettle Creek,	Clatham,	Henry M. Olson,	187	Emerick,	4/1/12
Kettle Creek,	Crossfork,	Harry VanCleve,	188	Emerick,	4/1/12
Kettle Creek,	Crossfork,	Harry L. Jarrett,	204	Emerick,	4/1/12
Seven Mt.,	Crossfork,	Howard J. Boop,	123	Bletsch,	4/1/12
Sinnemahoning,	Greenwood,	A. W. Ayres,	205	Perry,	5/1/12
Seven Mt.,	Hull,	Wm. C. Maurer,	183	Conklin, W. G.,	3/1/12
Clearfield,	Jacks Mt.,	Wm. E. Shults (f), .....	.....	McNaughton,	6/1/12
Clearfield,	Karthauss,	M. A. Barr,	207	McNaughton,	6/1/12
Minisink,	Karthauss,	Win. K. Hatton,	181	Avery,	3/1/12
White Deer,	Notch,	S. M. Rondarmel,	183	Winter,	4/1/12
Clearfield,	McCall,	L. M. Stover,	190	Winter,	3/1/12
Hopkins,	Penfield,	C. O. Timblin (g),	190	Kirk,	5/1/12
Rothrock,	Snow Shoe,	John Winkheleek,	192	Sheeler,	6/1/12
Rothrock, .....	.....	Wm. H. Moist (h),	197	Rodine,	8/1/12
Sinnemahoning, .....	.....	Sam T. Woodside,	206	Belline,	4/3/12
Sinnemahoning, .....	.....	C. A. Swartz,	194	Elliott,	7/9/12
Black Forest, .....	.....	C. M. Bailey,	208	Elliott,	4/1/12
Whetnam,	Waterville,	L. M. Rogers,	199	Evans, H. C.,	3/1/12
Young Womans Creek, .....	.....	R. K. Merrill,	186	Ryon,	8/15/12
.....	.....	Chas. Hemmerley,	162	Mumma,	4/10/13

(a) Resigned December 31, 1912.
(b) Resigned September 30, 1913.
(c) Resigned September 30, 1913.
(d) Resigned September 30, 1913.
(e) Resigned September 30, 1913.
(f) Resigned September 15, 1912.
(g) Resigned August 31, 1913.
(h) Died June 20, 1913.

**RANGERS WHO WERE APPOINTED PREVIOUS TO 1912 AND 1913 BUT
WHO RESIGNED OR DIED DURING THAT PERIOD.**

Forest.	Division.	Ranger.	Resigned.
Sinnemahoning,	Austin,	Wesley Hackett,	October, 1912.
Bedford, .....	.....	J. H. Sparks,	Died October 13, 1912.
Black Forest,	Blackwells,	Robert Thompson,	September 30, 1913.
Buchanan, .....	.....	Harry A. Reitz,	April 30, 1913.
White Deer,	Buffalo,	Chas. L. Braucher,	March 29, 1912.
South Mountain,	Caledonia,	Joseph O. Boggs,	September 30, 1912.
South Mountain,	Caledonia,	C. B. Lerew,	March 31, 1913.
South Mountain,	Caledonia,	James Winters,	September 30, 1913.
Grays Run, .....	.....	L. T. Newman,	September 30, 1913.
Seven Mountain,	Greenwood,	James H. Howard,	September 30, 1913.
Haldeman, .....	.....	Conrad Orth,	April 30, 1912.
Sinnemahoning,	Hull,	A. A. Bennett,	November 30, 1912.
Seven Mountain,	Jacks Mountain,	James Middleswarth, ..	September 30, 1913.
McClure, .....	.....	G. Frank Mohler,	September 30, 1913.
Nittany, .....	.....	Howard E. Wells,	March 31, 1912.
South Mountain,	Pine Grove,	Francis X. Drachbar, ..	August 31, 1913.
Minisink,	Pocono,	M. C. Cortright,	September 30, 1913.
Hopkins,	Renovo,	John Liggett,	May 31, 1912.
Rothrock, .....	.....	Eli Staybrook,	July 31, 1912.
Sinnemahoning, .....	.....	Joseph Kissell,	Died May, 1912.
Black Forest,	Slate Run,	M. E. Westcott,	September 30, 1913.
Stuart, .....	.....	Oran Snyder,	September 30, 1913.
Trough Creek, .....	.....	John M. Stever,	September 30, 1913.
Black Forest,	Waterville,	G. C. Spiegel,	April 31, 1913.
Whetham, .....	.....	A. M. Wilson,	January 31, 1912.
Young Womans Creek,...	.....	F. P. Miller,	May 15, 1913.

FOREST FIRES.

Under an early act of Assembly the Department annually collects statistics relating to the area covered and destruction caused by forest fires. These statistics will be found presented at the end of this volume for the years 1912 and 1913. In presenting this report, it seems necessary to make a few observations concerning the operation of the forest fire laws in this State.

The general fire warden's act of May 13, 1909, is a step in advance over previous legislation, but it does not completely accomplish the desired result by reason of the inability of the Department to apply all of its provisions in full force. The Department is convinced and has been for a number of years that the forest fire patrol system is the best kind of effort made to date to prevent the occurrence of fire. The practice of attempting to extinguish fires after they are once begun, giving no heed whatever in advance to prevention so that they may never start, does not and cannot produce the best results. Section 18 of the act referred to provides for daily patrol during the fire seasons in the discretion of the Forestry Commissioner, who is chief fire warden. There has always been an insufficient amount of money appropriated to enforce this section, and

for this reason it has not been possible to establish an adequate patrol. Could this be done, it is believed that proper men appointed and well stationed to observe danger points, would, in most instances, be able to attack fire in its incipency and extinguish it before it has reached the proportions necessary for summoning a fire fighting force. Such patrol service accompanied by the building of suitable lookout towers would place the fire problem completely under control of the patrolmen of the region. Until the possibility is at hand of making such an enforcement of the Act of Assembly, it is useless to look for a control of forest fires in this State.

Under the law the fire wardens make reports showing the area burned and the approximate losses sustained. In some instances they must rely upon the reports of the owners damaged. The tendency on the part of the owner is to make the area and the loss of maximum rather than minimum size. However, the true losses are of a size altogether too great, and the problem is to confine fires to smaller areas or to prevent them altogether, and thus, in corresponding manner, decrease the aggregate of the losses.

An analysis of the fires reported for 1913 shows that 927 fires occurred, 723 being between January 1st and June 30th, the first six months of the year. A significant fact is that the real fire season generally opens on the day trout fishing begins. The connection here seems to be so obvious of carelessness on the part of fishermen that the force of the inference cannot be avoided. There is also a certain amount of carelessness on the part of hunters in the fall of the year, but since the figures show that only 199 fires occurred between July 1st and December 31st, and that the hunters probably outrank the fishermen in number, it is seen at once that few fires must be laid to the carelessness of the hunters.

The burned area for this year according to reports received is 470,738 acres, or a tract nearly half the size of that now owned by the Commonwealth for forestry purposes. Of course these figures do not relate wholly to State land, but include the fires on State land along with all those reported from all the counties in the Commonwealth. Mifflin county shows the largest burned area, 58,359 acres, a tract in size which is more than half of the reported wooded area of the whole county. The average number of acres per fire is 508, showing that the attack on fires is not so prompt as it ought to be and as it would be if a proper patrol system could be instituted and relied upon. In Blair county an average area burned per fire is 3,922. In this county the State owns no land for forestry purposes. Much of the timber area has been previously burned and it seems that private owners care little whether it burns a second time or many times.

The direct loss reported from all fires is \$761,590. The average loss per acre burned is \$1.61. Although this is a figure conceded by many states to be a minimum rather than a maximum loss, the figure is too high and should in the near future be decreased by at least one dollar. There is no way of computing the indirect losses which result to bird life, game animals, the effect upon spring and stream flow, and the general retardation of unkilld growth within the burned area.

The greatest loss reported by any county is Mifflin, where more than half the wooded area was reported burned over, and amounts to \$74,512. All this is direct economic waste, and yet the people and their representatives in the Legislature do not seem to have come to the conclusion that the extinction of forest fires is an immediately pressing governmental problem and should be met as such.

The cost for extinguishing fires in 1913 paid out of the special appropriation of \$50,000 for two years, was \$26,451.93. In addition to this amount, foresters, rangers, and laborers in the employ of the Department contributed their time to extinguish fires on State land and adjacent private land. Private individuals and corporations paid large sums to protect and extinguish fires on their lands. Could the aggregate of this expense be determined, it probably would not be much less than the whole appropriation made by the Legislature.

The loss per acre as reported, varies from 42 cents in Warren county to \$25.00 in Bucks county. In Potter county the largest sum was paid for extinction, \$2,097.80. The average cost of extinguishing fire per acre burned over is 5.6 cents. But it must be recognized that as the average area per fire decreases, the cost of extinction per acre will increase.

Among the causes producing forest fires, those which are unknown stand at the head of the list with 320 cases. Most of these undoubtedly are from carelessness and incendiarism, and it is surprising to what a large extent incendiarism prevails. Cases are known where the facts point to the starting of fire because of a desire to open up thick woods that hunting may be better in the fall, or that huckleberry bushes may grow, or that timber may be killed, so that those residing nearby may buy dead timber for fire wood at a cheap rate. In the face of all the effort to spread knowledge respecting the enormous waste and the uselessness of tolerating fire in the woods, men in utter disregard of what must be better knowledge, still permit their personal feelings and prejudices to control them.

Next to the causes which are unknown are the railroads, with 217 fires to their credit. The known incendiary fires are 121 in number. Every one of these started under circumstances pointing directly to this cause, but the criminal of course, in each instance, was far

away by the time the fire was discovered. Smokers are believed to have caused 28 fires. The wretched practice of throwing down lighted matches or stubs or half consumed cigars or cigarettes still seems to be thought the proper thing on the part of those thus offending.

The experience of some other states is interesting in comparison with that of our own. In Massachusetts and New York an appropriation of 1 cent per acre is annually made for the protection of forest land. If this were to be observed by Pennsylvania, taking $7\frac{1}{2}$ million acres or one-third of the State's area as the forested area which should receive such protection, it would indicate an appropriation by each Legislature of \$150,000 for each 2-year period. As a result of adequate protection which these states may give, the average acreage per fire in Massachusetts in 1912 was 11 acres, and in New York 18 acres. Set this over against Pennsylvania's average of 508 acres per fire, and we instantly see that the acreage rises as the possible protective effort falls.

In some of the newer western states, by no means commensurate with the developed resources or wealth of Pennsylvania, an appropriation amounting to $1\frac{1}{2}$ cents per acre is devoted to forest fire protection, and a large part of this is contributed by private interests. The interests of Pennsylvania are by no means of less importance than those of other states. These facts are exhibited for the purpose solely of calling attention to our situation and in the face of the facts this Department is helpless to accomplish better results. If it is the State's duty to buy and manage forest land, it should surely be regarded the State's duty to prevent the destruction of her forests, an effort just as valuable for the economic welfare of the State. The Commonwealth rigorously prosecutes violations of the food laws or the health laws and furnishes an abundance of money for the enforcement of these laws. It is sincerely hoped that at no distant date the State may through its agency, the Legislature, see the forest fire problem in much the same light.

Against Pennsylvania's \$25,000 appropriation for 1913, it is interesting to set out the annual appropriations in some other states:

Maine appropriated \$67,900 to protect 9,500,000 acres.
Massachusetts appropriated \$25,000 to protect 2,500,000 acres.
New York appropriated \$75,000 to protect 7,200,000 acres.
Minnesota appropriated \$75,000 to protect 20,000,000 acres.
New Jersey appropriated \$15,000 to protect 2,500,000 acres.

All of which points to the fact that this State needs an appropriation of from \$75,000 to \$100,000 a year to protect her forest interests adequately.

By act of Assembly approved July 27, 1913, P. L. 906, the Department of Forestry is authorized to enter into co-operative relation with local forest fire associations for the prevention and suppression of forest fire. The Department is authorized to expend for patrol purposes a sum equal to that expended by the association, but not in excess of \$30.00 per month for each patrolman. The full text of the act is as follows:

A SUPPLEMENT

To an act, entitled "An act to create a system of fire-wardens to preserve the forests of the Commonwealth, by preventing and suppressing forest fires, and prescribing penalties for the violation thereof; providing for the compensation of the fire-wardens and those who assist in extinguishing fire, and making an appropriation therefor," approved the thirteenth day of May, one thousand nine hundred and nine; conferring authority upon the Department of Forestry to enter into cooperative relations with local associations established for the purpose of preventing forest fires, and providing for and regulating a local fire patrol and the compensation thereof.

Whereas, The question of forest fires and their suppression has become a serious problem within this Commonwealth, the losses therefrom amounting to large sums of money each year, which losses ought to be prevented by adequate legislative authority and assistance; and

Whereas, Local associations for the prevention and suppression of forest fires have been established in different parts of the Commonwealth, composed of owners of land with timber growing thereon, whose lands are every year subjected to the menace of forest fires; and

Whereas, It is desirable that the Department of Forestry co-operate with such associations, and render assistance to them in accomplishing to the best advantage the work which they are established to do; therefore,—

Section 1. Be it enacted, &c., That the Department of Forestry is hereby authorized to enter into co-operative agreements with local forest fire associations, within this Commonwealth, for the prevention and suppression of forest fires; and is hereby authorized to expend, from its general forest fire appropriation, for this purpose, a sum of money equal in amount to the amount which shall be expended by each local association for the employment of proper persons to patrol such lands during those danger seasons of the year known as the forest fire seasons, and for such period of time each season as, in the judgment of the local association and the Department, it is necessary or expedient to maintain such regular patrol; and under such terms and conditions made with such local associations as, in the judgment of said department, will produce the best and most satisfactory results in the prevention and suppression of forest fires: Provided, That such expenditure by the department shall not exceed thirty dollars per month for each patrolman.

Section 2. Every such local forest fire protection association shall render to the Department of Forestry, at the end of each calendar year, a report showing the number of acres of land comprised within

the activities of the association, and an itemized statement of all receipts and expenditures during the year for which the report is rendered. And in case no appropriation shall be made by the Legislature for forest fire and protective work at any future time, all such co-operative agreements, subsisting at that time, shall be construed as being suspended during such interval for which no appropriation is made. Said local association shall also report any general results of the work that the Commissioner of Forestry may desire.

Section 3. The fire seasons hereinabove mentioned shall not be construed, by reason of the act to which this act is a supplement, as being limited to the periods of time stated in the eighteenth section thereof.

Section 4. When any group of land owners desire to organize themselves into a mutual forest fire protective association they shall promptly notify the Commissioner of Forestry of their intent, if it be the desire of such land owners to avail themselves of the benefits of this act.

APPROVED—The 22d day of July A. D. 1913.

JOHN K. TENER.

By Act of Assembly approved July 21, 1913, P. L. 864, the Department is authorized to designate in districts which shall be coterminus with one or more of the counties of the Commonwealth, certain of the foresters in the State service, who shall then be known as district foresters. Among the duties which they are to perform is the instruction of the fire wardens, to report upon their work to the Department, and to have general supervisory control of the fire wardens within that district. The full text of the district foresters' act is as follows:

A SUPPLEMENT

To an act, entitled "An act to establish a Department of Forestry, to provide for its proper administration, to regulate the acquisition of land for the Commonwealth, and to provide for the control, protection, and maintenance of forest reserves by the Department of Forestry," approved the twenty-fifth day of February, Anno Domini one thousand nine hundred and one (Pamphlet Laws, page eleven), authorizing the Department of Forestry to designate certain of the foresters within its employ to act as District Foresters, in the performance of general forest work other than within the State Forests.

Whereas, In accordance with section three of an act, entitled "An act to establish a Department of Forestry, to provide for its proper administration, to regulate the acquisition of land for the Commonwealth, and to provide for the control, protection, and maintenance of forest reserves by the Department of Forestry," it is provided that it shall be the duty of the Commissioner of Forestry, among other things, "to encourage and promote the development of forestry, to obtain and publish information respecting the extent and condition of forest lands in the State, and to execute all rules and regulations adopted by the Forestry Reservation Commission for the enforcement of all laws designated for the protection of forests from fire and depredation," and

Whereas, It is desirable and expedient that that phase of forestry known as farmers' woodlot and private forestry be given greater consideration and assistance than it has heretofore received; therefore,--

Section 1. Be it enacted, &c., That the Department of Forestry be authorized to designate, wherever the demands of forestry warrant, certain of the foresters in the State Forest Service to be known as Districts Foresters, and that the districts to which they may be assigned shall be coterminus with one or more of the counties throughout the Commonwealth.

Section 2. It shall be the duty of the District Forester, under the direction of the department, to promote within his district the development of forestry by conducting such educational efforts as may be necessary to bring to the attention of the people the uses and purposes of practical forestry, to render assistance to forest and woodlot owners, to conduct experiments in forestry, to collect data concerning forests and woodlots within his district, to inspect and report to the department upon the work of the fire-wardens, to advise with land owners upon the planting and protection of shade-trees, to assist in Arbor Day work, and to promote and advance any other activity in local forestry which may be designated by the Department of Forestry. The District Forester shall be supplied by the Department with suitable office facilities and supplies to enable him to carry on his work.

APPROVED—The 21st day of July, A. D. 1913.

JOHN K. TENER.

In the general appropriation law of 1913, approved July 16, P. L. 779, among the appropriations for the Department of Forestry is the item of \$50,000 for paying all costs incurred in the prevention and extinction of forest fires. This sum is available from June 1, 1913 to June 1, 1915. For the period June 1, 1911 to June 1, 1913, a prior appropriation was made by the Legislature of 1911 and the same amount was similarly available.

PRIVATE FOREST FIRE PROTECTIVE ASSOCIATIONS.

The owners of timberland are realizing more and more that timber in Pennsylvania is a valuable commodity, and to be permitted to grow to its greatest value and highest usefulness the first great call is its proper protection. To this end private forest fire protective associations are being organized. The most notable instance of the

kind in this State is that of the Pocono Protective Fire Association, which was incorporated in November, 1902. It is, therefore, eleven years old, and has accomplished during that time a great amount of good in the way of timber protection in Monroe and southern Pike counties. From a report of the association rendered July 15, 1913, the receipts of the association from all sources since the date of organization have amounted to \$3,481.41. Against this fund the association has drawn and paid out \$1,975.35 for fire fighting, \$421.41 for legal expenses and the costs of organization and incorporation. Chemical fire extinguishers cost \$382.01. With the passage of the act transferring forest fire protection and supervision from the local authorities to the Department of Forestry, the membership declined and considerable areas were withdrawn from the association. At this time it is concerned with the protection of about 10,000 acres. The co-operative act of 1913 has resulted in an increased membership and a very much more lively interest. During 1913 its membership has doubled. It offers a standing reward of \$100.00 for information leading to the conviction of one who directly or indirectly sets fire to woodland. The first District Forester under the act of 1913 was designated for Monroe county. The forester of the Department in that region, John L. Strobeck, is the District Forester, who co-operates with the association. Under the law he assumes direct supervision of the fire wardens and their assistants. The efficient secretary of the association is Dr. W. R. Fisher of Swiftwater, Monroe county, who gives much of his time and effort for the success of the cause.

A second local forest fire protective association was organized in January and February, 1913, in Centre county, largely through the effort of Hon. J. Linn Harris of the State Forestry Reservation Commission, and Mr. J. M. Hoffman. Mr. Harris afterward became President of the association and Mr. Hoffman the secretary and forester. A report of the association rendered July 1, 1913, shows that there are about 300,000 acres of land represented in the association's membership. To meet the necessary costs, an assessment of one-half cent an acre was levied. During the current year the association will by this and other means, raise upwards of \$1,000. The Department of Forestry has co-operated with this association as it has with the Pocono association, and both are working in entire harmony. During the year in which the Central Association has been at work, it has accomplished much good in the neighborhood. Fifteen miles of fire lanes have been opened to the date of the report, and others are in progress. Thirty-five temporary lookout stations have been established. Permanent stations will be located later as the experience of the association determines where they may best be placed. Tele-

phone lines are to be installed as soon as it is possible to do so. Rural telephone lines are used wherever they may be procured to serve the purposes of the association. Twenty-four different patrolmen have been in the service of the association, and at one time as many as twenty were in service.

Members of this association are greatly interested in the success of the work, contribute liberally, and nothing but good results is expected from this effort.

FOREST TAXATION.

After a series of efforts extending through four Legislatures, beginning in the early part of 1907, although the subject was considered of vital importance and discussed many years before that date, the Pennsylvania effort known as the Auxiliary Forest Reserve bills finally became law by the signature of the Governor June 5, 1913. The draft of the first bills looking toward the consummation of this result, was made by Hon. S. B. Elliott of the Pennsylvania State Forestry Reservation Commission. Thoroughly discussed and considered by the members of the Department, it was finally introduced into the House by a member friendly to the cause of forestry who believed as those who are familiar with the subject always have believed, that the then taxation system of the State made an unfair discrimination against non-productive timberlands. The bills failed to become laws at this session, but in revised and amended form were reintroduced into the sessions of 1909 and 1911, likewise failing of passage. In a further amended form they were introduced into the session of 1913, and through the efforts of the friends of forestry, and particularly of Dr. Henry S. Drinker, President of Lehigh University, a member of the Pennsylvania Forestry Association and President of the American Forestry Association, the bills were finally passed and were approved by the Governor. These laws are three in number. The first provides for the creation of a new division of lands in Pennsylvania, to be known as "Auxiliary Forest Reserves." The second relates to the modification of taxes on lands placed within this division, the thing which has been sought for in Pennsylvania for at least forty years. The third provides for the payment of certain fixed charges on lands to be entered in this new class, to be distributed

as therein directed, in order that certain municipal units may not be hampered by loss of tax by reason of the placing of lands within the new class.

The name "Auxiliary Forest Reserve" was originated and applied by Mr. George F. Craig of Philadelphia, a lumber dealer of wide experience and a friend of proper forestal effort. The name seemed to be appropriate and has now been used as the permanent designation of the new class of lands so created.

Thus has been accomplished after years of patient effort and education the desire of the friends of forestry in Pennsylvania for some modification of the taxation laws relating to forest lands. The idea has been thought so good that it has been followed in the states of New York and Louisiana; and at this time this form of law or something similar seems to offer the only solution to the real difficulty regarding forest taxation.

Since the taxing act is limited to take effect only with the tax year one thousand nine hundred and fourteen (1914) nothing further in the way of entry of tracts into this class may be reported at this time.

The full text of the acts referred to above is as follows:

AN ACT

To classify certain surface lands as auxiliary forest reserves; to prescribe the terms and conditions for their continuance in said classification, or their withdrawal therefrom; and to provide for the expenses attendant thereon.

Section 1. Be it enacted, &c., That in order to encourage the growing of such trees, now existing or hereafter produced, as will at the proper age be suitable for merchantable forest products, whether such be of natural reproduction or from seed sown, or trees planted out, or all combined, all surface land which may be set apart according to the provisions of this act, and exclusively used for growing such trees is hereby constituted a separate and distinct class of land, to be known as auxiliary forest reserves.

Section 2. When any owner of surface land desires to have such land placed in the class established by section one of this act, such owner shall notify the State Forestry Reservation Commission of his desire in manner and form to be prescribed by said commission. Said notice shall contain a description of the land, its location, boundary, area, and character, and shall state as far as practicable the species, character, and condition of the trees growing thereon, and whether they are of natural reproduction or are from seed sown for the purpose, or have been set out on said land, or all combined, and such other information as the commission may require. If, upon receipt and consideration of this notice, the commission shall, in its discretion, deem the conditions such as to warrant action on its part to determine whether such land should rightfully be placed in the class established by section one of this act, it shall cause the same to be examined by some person learned in the practice and principles of

forestry, and a report made thereon, and if, upon receipt and consideration of such report, it decides that such land should be placed in the class established by section one of this act, it shall so declare and certify to the commissioners of the county in which said land is located.

Section 3. Upon receipt by the county commissioners of such certificate of the commission it shall be their duty at once to place said surface land in the class established by section one of this act, and keep the same therein until the trees growing thereon shall, in the judgment of the commission, become sufficiently large and suitable for merchantable forest products, or the land be devoted to other purposes: Provided, however, That the certificate of the commission shall not become operative to place said surface land in the class established by section one of this act until the owner of said surface land has agreed, in writing, with the commission to care for the trees growing thereon, according to the instructions and directions of the commission, up to such time as such trees become suitable for merchantable forest products; and if any such owner at any time fails to care for the trees growing on said land as agreed with the commission, and due proof thereof is made, the commission may remove said surface land from the class established by section one of this act. In case of such removal, either through failure of the owner to care for the trees or on his expressed desire for removal before the trees shall have been cut at maturity and tax paid thereon, the county commissioners shall, on notice from the commission, proceed to recover from said owner, for the use of the county and township, by an appropriate action at law if necessary, the difference in the amount of tax which would have been paid by the said owner at the rates established for the years for which recovery is sought and the rate provided for auxiliary forest reserves, with costs of suit, to be recoverable from the time when such land was placed in the class of auxiliary forest reserves. And the commission shall remove said surface land from the class established by section one of this act at any time that the then owner shall, in writing, notify the commission that he desires such removal. The commission may, in its discretion, at the time said surface land is placed in the class established by section one of this act, require the owner to file with the commission his or its bond, of such kind and amount as the commission shall deem reasonable and sufficient to secure the obligations of such owner under this act.

Section 4. Whenever trees growing on said surface land have become suitable for merchantable forest products, the commission shall, at the request of the owner or on its own motion, make an examination of said land, and designate for the owner the kind and number of trees most suitable to be cut, if, in the judgment of the commission, there be any, and the cutting and removal of said trees so designated shall be in accordance with the instructions of the commission.

Section 5. If the owner of said surface land faithfully carries out the instructions of the commission with regard to the removal and marketing of such mature or other trees, as may be designated in the instructions of the said commission, and shall immediately replant other trees of valuable species, or so protect the young growth that the said land may immediately become covered with young forest growth, and does so with the approval of the commission, then such

surface land shall remain in the said class, established by section one of this act; otherwise, the commission shall notify the county commissioners that the said land is not being maintained in accordance with the written agreement of the owner and the instructions of the commission, in which event the county commissioners shall immediately remove said land from the class established by section one of this act. All expenses attendant upon the examination of the said surface land by the commission shall be paid for out of the moneys appropriated for the maintenance of the Department of Forestry, in like manner as other expenses for maintenance of said department are now paid.

Section 6. The owner of the said auxiliary forest reserves shall, at all times, have the right to remove therefrom trees, or portions of trees, which may be killed by fire, thrown or broken by the wind, or injured by other natural causes; and shall, under the direction of the commission, be privileged to make necessary thinnings or removal of undesirable species of trees, in order to improve the condition of the remaining trees; and, under the same direction, may be privileged to remove therefrom such timber, from time to time, as may be necessary and essential for use upon the neighboring cleared lands of the said owner, for general farm purposes.

Section 7. Any tract of land while remaining in the class of auxiliary forest reserves as above provided, may, nevertheless, be sold or incumbered by or through the owner thereof, but no sale or incumbrance, whether voluntary by the owner or involuntary under any statutory or judicial proceeding whatsoever, whether of any State or of the United States, shall effect a discharge of any obligation imposed under this act, and said land shall be removed from said class only in accordance with the provisions hereof.

Section 8. That all acts or parts of acts inconsistent herewith be and the same are hereby repealed.

Approved—The 5th day of June, A. D. 1913.

JOHN K. TENER.

AN ACT

To provide for the assessment and taxation of auxiliary forest reserves, and the collection, distribution and use of the taxes collected therefrom.

Section 1. Be it enacted, &c., That all surface land which may hereafter be classified and set apart as auxiliary forest reserves, in the manner provided by law, shall be rated in value, for the purpose of taxation, not in excess of one dollar (\$1.00) per acre and shall continue to be so rated so long as the said land remains within the class designated as auxiliary forest reserves: Provided, however, That if the said surface land be underlaid with coal, iron ore, oil, gas, or other valuable minerals, said minerals may be separately assessed. The assessors in the several districts in which such lands are situate shall assess such lands in the manner now or hereafter provided for the assessment of real estate for purposes of taxation, as if they had not been set apart as auxiliary forest reserves, and shall make their returns to the county commissioners in like manner

as is now or hereafter may be provided by law, subject to exception, appeal and final adjustment.

Section 2. Upon receipt of assessment returns from the various assessors, the county commissioners shall reduce, in their records, to a sum not in excess of one dollar (\$1.00) per acre, the assessment on all those lands which shall have been placed in the class known as auxiliary forest reserves, in accordance with certificates filed with them by the State Forestry Reservation Commission, and the original assessment returns made by said assessors shall be preserved.

Section 3. Whenever timber, on land which is included in the class of land known as auxiliary forest reserves, is about to be harvested, the then owner of the timber on said land shall give a bond to the county treasurer in twenty per centum of the amount of the estimated value of the timber to be harvested, and to be approved by the court of the county, conditioned to pay to the county treasurer, within ninety days after harvesting, ten per centum of the value of the trees immediately at and before the time of harvesting; which amount shall be ascertained by statement and return, under oath or affirmation, furnished in triplicate, one to the county commissioners, one to the county treasurer, and one to the commission, immediately after harvesting, by the then owner of the land, setting forth said value; which sum thus paid shall be divided and distributed by the county treasurer of each county—to the county, and to the poor district, the road district, and the school district of the township in which the auxiliary reserve is situate, pro rata, based upon the last assessed millage of taxation for county, poor, road, and school purposes within said taxing district.

Such sum of money when ascertained to be due as a tax by the filing of the foregoing statement and return, under oath, and, as hereinbefore provided, directed to be paid to the county treasurer by the owner of an auxiliary forest reserve, shall, from the time of such filing, be and remain a lien upon the land of such owner until payment shall have been made: And be it further provided, That all moneys received by the boards of supervisors shall be appropriated exclusively to the opening, maintenance, and repair of the public roads now or hereafter passing through or into said auxiliary forest reserves, or upon which said reserves now or hereafter may abut; and, in the event that no public highways pass through or into said reserves, or none of said reserves abut on such highways, then said moneys shall be used for general township road purposes.

Section 4. Should the county commissioners be dissatisfied with the return made, as hereinbefore provided in section three hereof, the court of common pleas of the proper county, on petition of the commissioners, shall appoint a board of three appraisers, who shall go upon the land in question, estimate the quantity and value of the trees immediately at and before the time of harvesting, and make a return thereof to the court, which said return shall then be made the basis upon which each owner shall make payment to the respective county treasurers, unless changed upon appeal. The said appraisers shall be duly sworn or affirmed before entering upon their work, and either party, if dissatisfied with the report of the appraisers shall have right to appeal to the court of common pleas of the county, within ten days, after such report shall be filed and notice

thereof given the owner. The said appraisers shall be allowed their expenses and a compensation to be fixed by the court, both to be paid by the county commissioners.

Section 5. In case of the removal of said lands from the class known as auxiliary forest reserves, prior to the maturity of the timber, and without payment of the tax of ten per centum of the value thereof, as provided in section three of this act, the county commissioners shall, on notice from the commission, ascertain the amount of the taxes which would have been paid by the said owner on the original assessment before the reduction provided for in section two of this act, adding legal interest from the date when each tax payment would have become delinquent. The said commissioners shall likewise ascertain the amount of taxes which have actually been paid upon the land in question, adding legal interest upon all such payments from the date when paid, and certify the result thereof to the county treasurer, who shall then proceed, in the manner provided for the collection of county taxes under general laws, to recover from such owner the difference between the two amounts, with costs. Such difference, so ascertained to be due as tax as aforesaid, shall be and remain a lien upon the land of such owner until payment shall have been made.

If such land shall be so removed from said class after the due cutting of a matured crop and the payment of tax thereon, the owner shall, in that case, not be liable for such past assessment; but the land shall thereafter be liable to assessment and tax as all other land not classed as auxiliary forest reserves.

Section 6. This act shall take effect only beginning with assessments made for the purpose of levying taxes for the fiscal year one thousand nine hundred and fourteen.

Approved—The 5th day of June, A. D. 1913.

JOHN K. TENER.

AN ACT

Providing a fixed charge on land classified as auxiliary forest reserves; and the distribution of the fund thus set aside for school and road purposes.

Whereas, By existing law the State forest reserves are subject to an annual charge of two cents per acre for the benefit of schools, and two cents per acre for the benefit of roads, in the respective districts in which said reserves are located; and

Whereas, It would be a hardship to withhold from school and road districts the taxes which would otherwise be collected from land classified as auxiliary forest reserves; therefore,—

Section 1. Be it enacted, &c., That all lands which shall hereafter be classified as auxiliary forest reserves shall be subject to an annual charge of two cents per acre for the benefit of the schools, and two cents per acre for the benefit of the roads, in the respective districts in which said reserves are located. Said charge is hereby made payable by the State.

Section 2. The State Forestry Reservation Commission shall certify to the respective school districts and road districts, throughout the Commonwealth, in which auxiliary forest reserves are located,

the number of acres thus set apart and classified in each district, and the charge against the same; and shall, furthermore, certify to the State Treasurer the number of acres as aforesaid, and the charge against the same, in favor of the respective school and road districts. The State Treasurer shall, upon the approval of the proper warrants of the commission, pay to the several school districts and road districts the amount due the same from the Commonwealth, as derived under this act.

Approved—The 5th day of June, A. D. 1913.

JOHN K. TENER.

MUNICIPAL FORESTS

In the report of this Department for the years 1910-11 will be found a short discussion of the municipal forest act passed in 1909 and a mention of the effort then being made by the city of San Diego, California, respecting the use of a 7,000 acre tract of land for municipal forestry purposes.

Further information at hand is to the effect that during the winter of 1911 this city maintained a camp in this forest for out-of-work men. Each man received at least ten days' work with board and lodging and 50 cents pay per day. To be sure this was small, but it helped to that extent. This labor was used in cleaning up the land and the planting of trees. Many of those who were arrested for trivial offences, as drunkenness or vagrancy, were put into the colony and thus helped to a fresh start. The plan is reported as successful and a good investment commercially and socially. Through this method of handling a problem which is giving all our cities a greater or less amount of concern, San Diego hopes to put herself forward as one of the most progressive cities of the country.

There has been more or less discussion respecting the availability of suitable tracts for municipal forestry purposes in this State. The mountains to the east of Reading have been referred to as possibly the best location at hand for a start of this kind. It would be a most interesting experiment were Reading to avail herself of the privilege conferred by the act of Assembly, and by the nearness of the mountains, a part of which lie within the bounds of the municipality itself.

Scores of cities in Europe, large and small, are enjoying the benefits conferred by municipal forests. Some of them are enabled to realize the entire cost of running the affairs of the municipality from the returns of their forests. In these happy regions there are no such things as taxes, and in others the telephones and street cars are used by the people without cost, for being owned municipally they are maintained by the forest revenue. Probably the most notable European municipal forest is that of the Sihlwald or city forest of Zurich in Switzerland, located at a considerable distance from the city itself. The Sihlwald was organized and forest working plans made as early as 1680. It is at present under intensive management and is the pride of the nation. The gross yield of this forest is at times the highest of any known in Europe, occasionally reaching \$12.00 per acre, although in the high Alps the yield sinks to a considerably smaller amount. The experience of these municipal forests has been that the higher the expenditure for maintenance and development the greater is the return. Numerous instances are known where the average yearly acre return runs from \$4.00 to \$6.00. Wood prices are higher in Europe than they are in America, but land is cheaper in America than in Europe. The example of the European forests points to one conclusion, and that is that the cities of Pennsylvania might reasonably avail themselves of our municipal forest act and reap therefrom a substantial revenue, besides gaining other things which would be of advantage to a municipality.

FOREST EXAMINATIONS AND REPORTS.

Members of the Commission and of the office force have been engaged throughout this period in making outside examinations and reports as well as doing much work of this character within the State forests. Dr. Rothrock, Mr. Elliott, and Mr. Harris of the Commission have devoted many days to such work, and Mr. Williams and Mr. Wirt of the Department and a number of the foresters have responded to calls wherever it was possible for them to do so.

In January, 1912, Messrs. Elliott and Harris made an inspection visit to the State lands in Tioga, Potter, and Cameron counties. They visited the Asaph nursery first and then studied the nearby State lands, observed the condition of the tree growth and noted

the possibility for future work. A considerable quantity of dead and dying white pine stock was found, and in their report they recommend its removal. Road conditions within this region necessary for opening up the forest properly, were likewise considered. They especially gave their attention to a new public road to pass up along Straight run. From Ansonia the inspection tour was continued to Galeton and Austin, visiting the lands of Forester Silvius, thence to Keating Summit and Emporium, where they continued their observations through the Sinnemahoning forest with Forester Elliott.

They were impressed with one fact particularly, and that is wherever there are good stands of timber reasonable protection by wide fire lanes should be given, followed by a patrol service during the danger seasons where the fire danger is greatest. Because of the large areas of denuded land, they urge, as formerly, the increased growing of seedling trees and their planting into permanent position.

In October, 1912, Messrs. Elliott and Harris were requested by me to make an examination of the premises at Caledonia, particularly the Graeffenburg Inn and the forester's headquarters, with a view to recommending such repairs as to them might seem necessary. Such inspection was made, and as a result of their examination certain repairs were undertaken and carried out. They found the walls of the building in need of immediate repairs. The wood work needed painting and some of the floors were out of line. The foundation was seen to require reinforcing and that proper anchorage should be made between the walls and floor timbers. The roof likewise was found to be in need of immediate repair. They found the back kitchen in an unsanitary condition and recommended that either a new one be built or very substantial changes made. In fact, their inspection of the whole building showed the need for rather large repairs, all of which have since been done and the property is now in good condition. Since their inspection and recommendation it was found necessary either to repair the stable on the premises or build a new one. The condition of the old building was found to be such that it would not be an economic expenditure of money to attempt to repair it, so plans were prepared for the building of a new stable, and after calling for competitive bids, which call was advertised largely in the neighborhood it was found that the Department could do the work much more cheaply itself, and this was accordingly done. The result is a new and enlarged stable which will be suitable for all purposes of the forest headquarters for many years to come, as well as accomodate those who call at the Graeffenburg Inn.

Miss Dock of the Commission has collected much information respecting this locality, and has embodied the same into a short report together with certain recommendations. Because of the his-

torical value and need for the preservation of such facts in the public record, this report is included in full.

"Graeffenburg Inn.

"Graeffenburg Inn today is one of a group of buildings erected about 63 years ago by David Goodyear, on the site of an earlier built road-house said to have been of log and frame.

"The present building was first called after its builder 'Goodyear's Tavern,' but in the year 1850, Hon. Edward McPherson, who later became the executor of Thaddeus Stevens, but who at that time was one of a group of young people who visited the Inn much as the 'House-parties' come at present, prevailed upon Mr. Stevens to have a post office established in the Tavern, for the accommodation of the guests, who otherwise had to send for their mail at Fayetteville, or Cashtown, although the stage passed by daily, running three days of the week from Chambersburg to Gettysburg, and returning the day following.

"The post office was established in 1851, and Mr. McPherson was given the privilege of naming it, and as Mr. Goodyear had developed one of the water-cure establishments then becoming popular, Mr. McPherson named the building after the great Austrian Water-Cure 'Graeffenburg Springs Hotel,' and Mr. Goodyear was appointed postmaster, the receipts for the first year being \$19.00. The mail was delivered in what is now the private dining-room, and while it was brought in, the stage horses watered at the trough of running water then standing almost beside the stone steps leading down from the dining room porch.

"About 1895 or 1896 the trough was removed to a fence about 100 feet from the house, running along the green from the pike to the barn.

"So late as 1889 and 1890 when members of my family first visited this region, the bath-house on the green east of the house was still standing, but the old ten-pin alley northeast of the barn had been removed, or had fallen down.

"The Springs Hotel had quite a vogue for a time, as also had old Caledonia Springs Hotel, seven miles to the southeast, which was owned by Col. A. K. McClure for some years.

"Merging of Caledonia and Graeffenburg.

"Mr. Stevens' first purchase of land at the present Caledonia was made in 1830; the furnace was built in 1837, and the Caledonia Furnace lands and Goodyear tracts were separately owned until acquired in 1888 to 1890 by the Dillers of Lancaster, who purchased the Caledonia tract from Mr. Stevens' Executor, and later purchased the Springs Hotel, which was then closed for several years to the public, but used as an office and residence, first by the Dillers, and subsequently by the officials and some of the employes of the ill-fated 'Caledonia Mining and Manufacturing Company.'

"This company, organized about 1891, built the railroad from Fayetteville to Wolf Hill, and their consulting Engineer was no less a person than Wm. Barclay Parsons of New York.

"During the operations of the Dillers and their successors, a great deal of lumber was cut, a shingle mill stood where the path now runs to the pavilion above the furnace stack, a flint quarry was opened above the peach orchard, on Huckleberry Ridge, a mill to grind the rock was operated near Mt. Union, and the product was shipped to the Trenton potteries.

"In the hotel building, the room at the western end was used as the company's office; the present office was a store-room, later closed when the company ceased work, about 1895.

"One of the company's staff, Jos. Ranney, was left in charge of the entire property, and the hotel building was managed by one of the former employes, John Aldridge, who with his wife occupied the building and was allowed to take boarders until shortly before the property was transferred to the Commonwealth, in December, 1902.

"The house has had a patronage of rather unusual character, as at different times educators and scientific persons of renown have visited Graeffenburg professionally.

"The South Mountain is noted for the purity of its water supply, the delightful and invigorating quality of its air, the varied character of its forest growth, and the extraordinary beauty of its woods and streams.

"The Professor of Botany at Wilson College has identified 800 species of plants in this locality, and the entire district from Mt. Union on the west to Cashtown on the east, is known to hundreds who visit it yearly for pleasure, sport, health, rest, and for old association.

"The Caledonia-Graeffenburg district is a natural resort, and the Graeffenburg Inn is the natural centre of the district; and while it is true that some of the patrons of the Inn are persons of large means, the vast majority of patrons are persons of moderate or even small means. In my judgment the State is fully justified in maintaining places of recreation such as the Graeffenburg Inn, which enables persons of moderate means to enjoy scenery and opportunities for quiet inexpensive recreation such as should be possible in many places of similar character all over the State. As a rule such opportunities are frequently, if existent, only adapted to the wealthy by reason of expense or other prohibitive reasons.

"Propositions to consider if Graeffenburg Inn is improved or enlarged.

"If measures are taken to continue Graeffenburg Inn as a public resort, it is urged by the resident forester that one large assembly room be provided, as the demand in winter for a room of this character is very frequent for dances, and meetings of all sorts, smokers, reunions, etc.

"If such an assembly room could be provided, or even if it is not, I would recommend that because of the unique features of the vicinity and also because of the large number of visitors connected with schools and colleges, that the Department of Forestry take measures to develop the educational possibilities of the locality.

"1st. By means of maps, and every form of information concerning the topography, geology, natural features, flora, and fauna of the district, all such information to be put into attractive form.

"2nd. Maps of *all kinds*, as of Federal forest, other State forests, Natural and State Parks, Bird Protective Islands, and especially, well-done maps of the South Mountain Forest, showing roads, fire lines, forestal divisions, ecological groups, etc.

"3rd. A case of good forest and 'out-door' books up-to-date. A revolving stand would be a good way in which to exhibit specimens of trees, shubbery, photographs of forest work, and other scenes.

"Briefly, to place attractively and as fully as possible a collection of objects intended and likely to help people to understand the position that Pennsylvania holds in the great protective movements of our times.

(Signed) Mira L. Dock."

After the inspection at Caledonia had been concluded, Messrs. Elliott and Harris went to Clearfield for the purpose of making further study of the State forests in that region. They found the young forest plantations in vigorous condition and so report. The large area of burned-over land, however, is most impressive, and further emphasizes the need of additional planting. Considerable cleaning up of the forest area is needed in this region so as to remove the debris left by lumbering and the trees which have since been killed by repeated fires. The local forest nursery was found to be in good condition and showed a remarkable growth of young trees. A system for supplying water when needed by the young plants, is badly needed at this station, and recommendation for the installation of such is made. Repairs at the ranger's house and certain new construction were found to be necessary. The roads and fire lanes were found to be planned after a satisfactory system.

Forester Kirk's lands in the neighborhood of Penfield were found to exhibit much of the same conditions as in the Clearfield division. The work there was found to be progressing as satisfactorily as conditions and the funds at hand would permit. From Penfield they went to Sinnemahoning, where they met Forester Elliott and made a study of the area under his care, noting particularly the plantings of white pine, larch, and other species which have lately been set out in this region. A growth of 20 inches for some of the white pines was no unusual sight. All these lands are yet in an unsatisfactory condition and their development proceeds slowly because of the difficulty attending their administration. Afterward, Messrs. Elliott and Harris were met by myself at Renovo and in company with Mr. Royce, representing the Lackawanna Lumber Company, we went to Crossfork for the purpose of inspecting and studying the character of lands offered by the Lackawanna Lumber Company for sale to

the Commonwealth. Here we met Forester Emerick and one of his rangers.

All the foresters and forest employes were found to be taking a deep interest in their work, studying with great care all the problems which confront them. The hopeful spirit among them all makes them ready at all times to undertake any project which will aid in the better prosecution of their work and produce an early attainment of the desired results.

Mr. Elliott remained a time at Crossfork after the departure of the other members of the party, and concluded a further inspection of the lands in southern Potter county in company with Forester Emerick. They visited the ranger stations and studied particularly the opportunities which both foresters and rangers have for doing further forest planting. Much of this region consists of steep slopes and its proper reforestation is no easy problem. Here is an area of 87,000 acres under the charge of one forester with adjacent land managed by other foresters. The soil, the possibilities, and the present characteristics are substantially alike in all. Upon this foundation the foresters must build their structure, and the whole effort is based upon forest planting.

It is the belief of those making this inspection that 87,000 acres for one forester is too large an area. A division in the near future ought to be made so that more intensive management may be pursued. Land in this part of the State is utterly worthless for any other than forest growth. Since the timber has been removed, private owners care little or nothing about it. Thousands of acres have been literally abandoned. The State will need it at some time for forestry purposes, and in State ownership it can be accorded better protection than if lying wild and uncared for.

Occasionally application is made for the development of valuable minerals supposed to exist on State land. Such an application was made by Benjamin Vaughn, who desired to exploit for coal on warrant No. 4346 in Morris township, Tioga county. This supposed coal field was, therefore, inspected and reported upon by Mr. Elliott. From his knowledge of the locality and experience in coal mining, he was the proper person to make such study. The territory in question was found to be at a distance from any present railroad, and if good coal were to be found the quantity would probably not justify the construction of a railroad. So far as this inspection was able to disclose facts, the possibility of coal being found there in paying quantity is believed to be remote.

In June, 1912, Mr. E. H. Mack of Wesleyville, Erie county, requested the examination of his woodland and a report thereon in order that he may know its possibilities for forest culture and what

should be done to make it produce a better stand of trees. Forester James E. McNeal was directed to make such examination and report, and did so on the above date. Forester McNeal found a 28-acre tract of woodland, of which he made careful study, and recommendations respecting its proper handling to the owner. The natural regeneration of the tract was found to be good except where it was thought desirable to change the stock species, and with the removal of the dead, dying, and suppressed trees it is believed the tract will shortly show the results of better care. Stock grazing was found to be one of the principal objections.

In September, 1912, Messrs. Elliott and Harris visited the lands of Foresters Mulford, Keller, Jerald, Thomson, and Byers. On Mulford's tract near Ansonia they studied again the white pine trees which are dead and dying, and which it will be necessary to convert shortly if their value is not to be lost. The trouble with these trees seems to be that they have been so badly scorched by forest fire that great wounds appear on most of them near the base, and these wounds interfere with their thrifty growth and are responsible for their decline. It is not likely that because of their age they will ever recover full vigor, and for this reason ought to be removed and the place given to young trees. All of Mulford's plantations were found to be in good order and showing well, particularly the Scotch pine, which here seems to be somewhat outgrowing the white pine for trees of this age.

Leaving Wellsboro, they met Forester Keller and Mr. Vaughn, the coal prospector, whose project has just been referred to. They then studied Forester Keller's plantations and found them in the same favorable condition. Roads and fire lanes in this region are of good character and the system has been planned with care.

From Blackwells they went to Slate Run, where they were met by Forester Jerald, and with him went to the Pump Station. In this portion of the journey they passed over much of the State land, some of which at present seems to be of a pretty worthless character, and will require a large amount of intensive management to make it good for satisfactory tree growth. Forester Thomson was met at the Pump Station, and his plantations were studied. Natural regeneration seems to be good in this region.

Coming to Williamsport, train was taken for Bedford, where the forester there, William L. Byers, was visited. Because of a series of rainy days, it was somewhat inconvenient to make the necessary inspections. The visit to Mr. Byers was entirely satisfactory, although the study of his work and the land under his care could not be made so carefully as in the other instances.

In April, 1912, Dr. Rothrock, by request, made a visit of inspection to the State forest in Monroe and Pike counties, going first upon the forest under the care of John L. Strobeck near Cresco. He first visited the sprag mill where Mr. Strobeck has been able to work up a lot of defective and otherwise worthless chestnut material into what are called sprags. He also found that there was a certain market for mine ties, and that his lands were capable of producing a fair quantity of this product, which when removed will be for the good of the land. The sprag mill venture was found to be a paying one. There was also found to be a market for hoop poles. Other timber was found, as pin oak, which has suffered severely from insect depredation, and which probably must be taken down in order to save it from total loss. The great trouble is transportation. It is not financially productive to pay more for removing a product than can be derived from its sale.

The forest plantations in this region were found in a satisfactory condition, having shown an average height growth of 14 inches. Mr. Strobeck's small nursery contains upwards of 30,000 trees.

A great need of this forest was found to be a proper dwelling for the forester. His present house is inadequate and unsatisfactory. That the forester and his wife were content to live here under such trying conditions was because of their devotion to the work. Several localities were examined with a view to the erection of suitable buildings. (A dwelling has since been built and is reported on at page 39.)

The roads in this region were found to be in a condition better than the ordinary mountain road. Whenever fire lanes may be converted into driving roads this is being done, for it keeps them open and saves the cost of brushing. Fire lanes here are necessary because the fire fighting force in these counties is small.

A visit to the Whitaker place recently purchased by the Department, occupied by Ranger Cortright, was then made. The small local nursery contained probably 100,000 seedlings. The serious drawback is inability to procure water for the seedlings at the time most needed. Certain repairs were found needful to both house and barn at this property.

From Strobeck's forest Dr. Rothrock called upon Forester Avery at Notch, meeting him at Hunters Range on the way in. On this division it was found that the scrub oak was rapidly disappearing because of the shutting out of light by more valuable species rising above it. The pitch pine which was formerly unpromising is now shown to be an attractive feature of the woods. Many of the trees have become suitable for forest products. A feature of Avery's division is the fire lane from near Edgemere to the Whitaker place, a

neat and effective piece of work built by Ranger Frank. It is direct and free from unnecessary litter and well located. During its course it is crossed by three other lines. Forest Ranger Frank has constructed a fire tower on the line. Its commanding site gives it a wide range and it is well built. The plan of the fire protective system was found to be satisfactory, but its progress toward completion is slow due to scarcity of labor when needed. The greatest need for the next fire lane seems to be the one from Bald Hill to Riley's, a distance of three miles. In other regions they are likewise demanded. The whole project of forest protection in this region depends upon a well located system of towers and fire lanes. A serious fire will destroy in a day many times the cost of the construction of these protective means and appliances. Many of the public roads require improvement and brushing out to make them effective fire lanes. A new road should be built through the Balsam Swamp running east through the Phillips and Stocker tracts, as it will afford the only means of reaching the region north and east of the Promised Land dam. The Promised Land region is a great problem and believed by Dr. Rothrock to be hardly less for us than the earlier one was to the Children of Israel. Much of the young growth coming on here is chestnut, which does not augur well for the future of the forest unless the chestnut bark disease can in some way be headed off.

The problems confronting these two foresters are radically different. Strobeck's is to thin out and dispose of undesirable timber and protect against forest fires, while Avery's is more the problem of planting, having practically no market for any of his product.

The increase of the commercial timber in Avery's division during twelve years has been really very great, consisting of pitch pine, white pine, spruce, chestnut, and oak, which with proper transportation facilities might be sold at a profit, and there are believed to be not less than 20,000,000 feet.

The buildings occupied by Ranger Frank and his family were found needing repairs, and certain recommendations are made by Dr. Rothrock respecting the repairs to be made. The ranger is taking good care of this property, and it presents an attractive appearance. These repairs have since been made.

Dr. Rothrock makes specific directions respecting the care of the most important roads for forest work, as they now exist. The State cannot do all the road work in Pike county, and the local supervisors should be made feel that they really were elected for a purpose.

An agreement was entered into in July, 1912, with S. B. Mikels of Canadensis, a carpenter and builder, for the erection of a house for

Forester Strobeck. This new building is located five miles north-east of Cresco in Monroe county. The sum paid for the carpenter work was \$450.00, and the other branches of the work were done by laborers in the employ of the Department, excepting certain portions which were completed with the aid of other local mechanics. The mill work for the building was furnished by the East Stroudsburg Lumber Company, Inc., for \$608.52. In order to furnish a proper water supply it was necessary to drill a well to a depth of 125 feet, which was done by Jesse Ransberry at a cost of \$375.00.

In August, 1912, the Deputy Commissioner of Forestry made a visit to Philipsburg, Centre county, where the citizens had recently become greatly interested in the problem of their street trees. Mr. Williams met about 40 citizens at this place in the public square, and a general discussion of the street trees was had. A formal report of the result of his inspection was rendered to the chairman of the street tree committee, Mr. Womelsdorf.

Two days later he visited the forest exhibit at Pittsburgh and then went to Sewickley and Glen Osborne to make an inspection of the property of Dr. Rinehart, who desired certain recommendations respecting the planting of his grounds so as to give them more of a forestal aspect.

The next day a visit was made to Beaver at the request of Mr. Stone, one of the county commissioners, and a member of the Beaver Shade Tree Commission, who wished to consult respecting matters of the shade tree law and the handling of their tree problems within that borough. On the same day he went directly from Pittsburgh to Washington, D. C. to attend a conference called by the Agricultural Department authorities, looking to State co-operation in handling the problems which have arisen by reason of the prevalence of the chestnut bark disease. At this meeting other representatives were present from North Carolina, Virginia, West Virginia, Maryland, New Jersey, New York, and Pennsylvania.

On September 25, 1912, Mr. Williams attended a meeting of the Montgomery County Horticultural Association at Norristown, before which Society he read a paper on "The Effect of Woods and Forests on Horticulture."

October 1-4, 1912, the Deputy Commissioner was present in the city of Indianapolis, Indiana, attending a meeting of the Fourth National Conservation Congress, and while there made a visit of inspection to the Indiana State Forest located near Henryville in the southern part of the State. Valuable information was gained by this visit respecting the growth and desirability of the western catalpa as a tree to be planted generally for forest purposes. The experience of the Indiana plantations has, like those of Pennsyl-

vania, not been all that was claimed for the tree, and in Indiana it is no longer recommended for general planting purposes except there be a disposition on the part of woodlot owners who wish to plant, to give up their very best corn and wheat soil to the growing of this tree. Few farmers are willing to do this, and catalpa planting is lagging considerably.

On January 15, 1913, at the request of the trustees of the Eastern Institution for the Feeble Minded and Epileptic located at Spring City, Mr. Williams made an examination of the wooded areas of land on the estate now managed by this commission and rendered a report thereon to the trustees. He found that a large part of the woodland on this tract was chestnut badly infected by the bark disease, and many hickory trees attacked by the hickory borer. The hickory and the chestnuts are likely to be destroyed entirely, and to this end he in his report recommended the substitution of different trees to take their places. He also considered the strengthening of the present woodlot stands and made a number of recommendations regarding other tree work which would greatly improve the attractiveness of the grounds.

LIVING CONDITIONS.

It is becoming increasingly necessary to furnish both foresters and rangers with better living facilities. A number of good buildings have thus far been erected, and in addition to those already reported on during the year the following structures were built:

The house at Leetonia for the accommodation of the ranger at that place. Contract for the erection of this building was let to Messrs. J. C. and S. A. Spencer of Wellsboro, and the building was put up for the contract price of \$2,564.00.

The barn at Caledonia and the improvements at Graeffenburg Inn are reported hereinbefore.

It became necessary to introduce a modern heating system into the houses occupied by Foresters Staley and Retan at Mont Alto, and a contract for a system of hot water heating was let to Hiram Wilson Hardware Co. of Columbia.

The repairs at the new forest headquarters at the Pump Station have put this set of buildings into good condition for the occupation

of the forester and one of his rangers, besides furnishing living accommodations for the families of two regularly employed laborers. A proper water supply for this station required drilling of three wells. A barn entirely new was also built.

REPORT OF THE FOREST INSPECTOR.

The report of George H. Wirt, Forest Inspector, as rendered to the Commissioner of Forestry, is too voluminous for publication in full. It will, therefore, be necessary to extract from it and condense sufficient data so as to give fair information of the work he has accomplished. Mr. Wirt's work during these two years has been of peculiar value in making examinations of difficult forest problems which have arisen throughout the State; in the preparation of a new series of blank forms now in use; his investigation of and recommendations for a uniform system of bookkeeping; his outside forest inspection and assistance to foresters; and his checking up of the foresters' and rangers' reports.

In January, 1912, he inspected and made a study of the pitch pine situation in the Hopkins State Forest. A large quantity of wood was discovered which ought to be removed from the land for the benefit of young woods. This timber is dead and decreasing in value. The regeneration was found to be good, but room must be made for it by removing the stock which now encumbers the ground.

On February 1st, a visit was made to the plant of the Newport Extract Co. to study the problem of utilizing blighted chestnut wood in the making of tanning extract, and also to determine whether or not the presence of the bark disease in the wood so used in any way decreases the value of the product. As a result of his study it was learned that the bark disease makes no difference whatever in the value of the result obtained.

From February 26th to 29th, he was present at State College during a week of instruction to the scouts of the Chestnut Tree Blight Commission, and gave lectures to the forestry students at the College, as well as to the men in the employ of the Blight Commission. At this time he procured from Prof. Buckhout, now deceased, a member of the first Forestry Commission, a valuable lot of papers relating to the early work of forestry in Pennsylvania. These are now the property of the Department and form a valuable chapter in our forest history.

In March Mr. Wirt investigated the problem of storing our forest tree seeds in the Department store room to determine whether keeping them there interferes in any way with their germinating qualities. It was learned that there was a decrease in weight of the seeds so received, and he recommended as a result of his investigation that all seeds be shipped to foresters as soon as received at the Department because of the too high temperature in the basement store room.

On March 18, 1912, Mr. Wirt made an inspection of woods for Morris Wood of Overbrook, Pa. The trees were found to be largely chestnut infected with the chestnut bark disease, and such advice and assistance were rendered as it was believed would enable Mr. Wood best to dispose of his trees.

On March 19th, an inspection was made of the woodlot of Albert Gray at Colmar, Montgomery county, to determine whether the wood present was financially mature and what proportion of it should be cut, if any. The same day an inspection was made of the property of Mrs. E. S. Meade located near Bycott in Bucks Co. A lumberman had contracted to remove some of the timber, and it was Mrs. Meade's desire to have a study made so that she might come to a more advantageous agreement with the contractor.

A great number of alleged remedies recommended to the Chestnut Blight Commission as capable of effecting a cure for the bark disease, led to the formation of a Board of Review to inspect and study the application of all such remedies and report thereon. This board consisted of Dr. Melville T. Cooke of the New Jersey Experiment Station, Brunswick; Prof. W. Howard Rankin of Cornell University, Ithaca, N. Y.; and Mr. Wirt. The board met on March 20th and considered the Burrows remedy which had been applied in the Lovett chestnut grove near Emilie, Bucks county. A further report was made on all the cures offered and will be noticed later.

On March 20th, Mr. Wirt left Philadelphia for Pittsburgh and on the following day inspected the woodlot of Mr. Robert T. Peebles ten miles from New Castle, Lawrence county. The trouble was found to be the hickory borer, and all species of *Carya* were being rapidly killed by it in that neighborhood, as well as in the western half of the State. The difficulty here as elsewhere was found to be in applying the proper management to the woods. Mr. Peebles expected to plant at least 4 acres of trees in the spring of 1913.

On April 2d, at the request of the New Century Club of Kennett Square, Chester county, he delivered an address on "What Forestry Means." An interested audience listened to the address and asked many questions concerning the work in forestry and the meaning of the invasion of the chestnut bark disease.

From Kennett Square, Mr. Wirt went to Peach Bottom in Lancaster county, and on the third of April examined a red oak planta-

tion on the farm of Mr. L. K. Stubbs of West Chester. This plantation was made in the spring of 1910. A large number of the trees, about 75%, had failed. To study the cause of this loss was his mission. It was found to be that in mowing grass the trees were cut and injured, thus interfering with their growth.

On Arbor Day, April 12, 1912, an address was delivered to the school children of Camp Hill, and in the evening an illustrated lecture in the United Brethren Church at Mont Alto was given on "Trees and Patriotism."

The Scranton Gas and Water Company desired an inspection to be made of their watersheds for the purpose of outlining future activities to care for this area in better manner than theretofore and to reforest the bare fields and hills. Accompanied by the corporation officials, an inspection was made and a written report rendered under date of April 24th. The report is too lengthy to be given at this place.

On May 20th, Mr. Wirt again returned to Scranton and superintended the planting of 80,000 2-year old white pines which the Scranton Gas and Water Company had purchased from forestry nurserymen for reforesting their lands, in accordance with the report previously rendered. The seedlings suffered in transit and were not in the best condition on arrival. However, they were planted and results will be determined later. It is the purpose of this company to plant from 80,000 to 100,000 seedlings every year, and the starting of a small nursery on their own account was recommended.

Prior to the above visit, on April 20th, a small woodlot belonging to Dr. E. M. Santee of Albany, N. Y., and Mrs. Isaac Shaffer of Hughesville, Pa., and located near Hughesville, was examined to determine whether the present stand required thinning. The situation with the trees, which were largely chestnut sprouts, was explained and the relation to them of the bark disease pointed out. The matter was left for them to determine.

On April 26th, Mr. Wirt was present at the beginning of a planting undertaken by the Shamokin Water Company on the South branch of Roaring Creek, Northumberland county. The planting was made about their reservoir, and was for protective purposes. They used in this work 10,000 Scotch pine, 7,000 Norway spruce, and 6,000 Austrian pine. The labor was supplied by foreign residents, who soon got the spirit of the planting and learned to do the work well. To show the efficiency of the crew after a little training, the average cost of the planting was \$2.55 per thousand trees.

On May 8th, Mr. Wirt made an inspection of woodland belonging to H. L. Curtin of Curtin. The area was about 5,000 acres covered

with sprout growth up to sapling size, and the purpose was to determine whether or not the operation to cleanse the woods should be undertaken. A negative report was rendered in this case.

Mr. H. K. Mattern of Julian, Centre county, desired advice respecting an improvement cutting in his timberland of approximately 300 acres. Mr. Wirt visited these woods on the 10th of May and explained to the owner what should be done and how to do it.

The Spring City Institution for the Feeble Minded and Epileptic had determined to do some forest planting in exposed areas, and for this purpose Mr. Wirt was present on May 24th and instructed in the planting of the trees.

On the 25th of May, he was present at the State Institution for the Chronic Insane at Wernersville on the same kind of mission. At these two institutions considerable land was found which is not valuable for other purposes than tree growth, and it is well that they be planted up to a good species of tree.

On June 3d a visit was made to the Crossfork division of the Kettle Creek State forest for consultation with Forester Emerick respecting his problems in forest management, and rendered the desired assistance.

An oak-infesting insect was reported to be doing damage to trees in the neighborhood of Irvineton, Warren county. Upon examination other insect troubles were found to be present. The trouble was found to be on the increase and no practical method seemed to be at hand to control the outbreak in large forest areas. It was explained that valuable shade trees might be saved by using a spray containing arsenate of lead.

On June 10th, a visit was made to Mr. C. W. Smith, President of the Warren Business College at Warren. Mr. Smith is an ardent student of the forest problem, and desires his students to be able to earn a part of their tuition by working in the surrounding timberlands. They had already begun a system of roads and trails, and expect to continue further forest work.

On June 12th several woodlands belonging to Mr. H. W. Smitten of Avalon, Allegheny county, but which were located near Savan in Indiana county, were inspected. These woods were found to be in need of general improvement and a report so rendered.

On June 14th, 1912, an inspection of about 700 acres of land belonging to the Fayette Coal Company of Pittsburgh, was made at Noblestown, Allegheny county. Most of this land was found to be suitable for forest growth only. The necessary information was given and a report in greater detail rendered thereon.

The Ringing Rocks Park Association near Pottstown, Montgomery county, desired advice with respect to the handling of their woodland.

tract, and for this purpose an examination and report was made on June 19th.

On June 20th an examination was made of the pine trees along Broadhead creek in Monroe county, made at the request of Mr. George Ransberry of East Stroudsburg. The trees were attacked by spittle bugs, and there was present some evidence of the white pine leaf blight. No great danger seemed to be threatening.

The Pennsylvania Forestry Association held its spring out-meeting at Bushkill, Monroe county, and on June 20th, Mr. Writ read a paper before the association on "Pennsylvania Forest Reserves." The paper was afterwards published in *Forest Leaves* and an illustrated address later on embodying the same thoughts was delivered to the students of Lehigh University.

On June 21st and 22d, Mr. Wirt examined the forest surrounding Silver Lake in Susquehanna county. The owner, Rev. J. Townsend Russell, desired first hand information respecting its value and the proper method of handling. A report was made thereon, as requested.

Dissatisfaction had arisen between the Oliver heirs and a contractor with respect to the manner in which he had been removing certain timber from their property. They also desired further information relating to a more systematic development of future growth. A careful handling for this property was shown to be needed and the method of procedure was pointed out. The forest fire risk here was found to be great, and an extensive system of protection was suggested and reported on. In making the inspection in this region, the carelessness of the railroads with respect to forest fires was noted, and the further fact learned that while there are many estates of small area in the locality, none of which could scarcely afford regular employment of a forester, yet many of them might combine in the employment of such an official, and from him receive efficient care and protection. It was suggested that some such plan be worked out either through a combination of the owners or in co-operation with the State Department of Forestry. It was further suggested that the Department has a duty in the premises and the problem of woodlot forestry should be given more serious attention than it has received in the past.

The York Water Company desired an examination of 212 acres surrounding their new impounding basin. Their wish was to cover the area with forest trees. On the first visit a preliminary report was rendered. Later, on October 10th, a detailed examination was made and report rendered.

On June 11th, a visit was made to the city of Altoona at the request of the Bureau of Parks, which had been put in charge of a

small woodland area for city park purposes. Recommendations which were thought to be useful for this work were made. It was further recommended that the hills and mountains surrounding the Altoona city reservoirs be planted and kept forest covered.

The Eastern Foresters' Association of the United States held its midsummer meeting at Petersham Forest, Massachusetts, the Harvard forest where the students of that university receive their practical training. This meeting was attended by Mr. Wirt during the third week of July, and a number of interesting and instructive operations were witnessed. One of the new things brought out was the use of wireless telegraphy in forest management, particularly in relation to forest fire problems. After this meeting most of the foresters in attendance went to the New Hampshire Forestry Conference in the White Mountains, where the forestry work of the New Hampshire people was reviewed and studied. An address was rendered to the meeting on July 18th on "The Management of the Pennsylvania State Forests." The people of New Hampshire are thoroughly appreciating their wooded hills and mountains. Because of the undeveloped woods of the second growth forests, little revenue may be derived from them at this time, but it is said that tourists leave annually twelve million dollars within the State. This should certainly be an incentive to our Pennsylvania people to endeavor to attract tourists to mountains which are just as beautiful as those of the Granite State.

The Pennsylvania foresters held their midsummer meeting on July 22d and 23d at Williamsport. At these meetings Mr. Wirt was present, and with the foresters inspected the Central Penna. Lumber Company's various mills. A study of such industries is highly valuable to our forest employees.

On July 26th, 1912, Mr. Wirt went to Chambersburg to examine some trees attacked by the locust borer and carpenter worm, and from there to Mont Alto, where he inspected the nursery and a portion of the State Forest under the charge of Mr. Staley.

The proposition to remove the defective beech, birch, and maple from Grays Run Forest had been brought up by Mr. Wells, the forester, and on the 5th of August an inspection was made of the conditions there existing.

The New Jersey Zinc Company is the owner of 1,000 acres of forest land near Palmerton, Carbon county, and desired a report on their tracts respecting proper forest management. Here was shown to be another opportunity for the employment of a forester in conjunction with other holdings in the same locality.

A grove of hardwoods near New Bethlehem in Clarion county upon examination was found to be infested with a number of des-

tructive insects. A report was rendered on the treatment of the grove and recommendations made respecting its future management. Here was well illustrated the relation between bird and insect life. The scarcity of birds was probably in a large part responsible for the large number of insects found. Other less important inspections were made during the same trip.

On August 30th, an inspection was made and report rendered on a woodland area of about 325 acres at Cooperstown, Venango county. At the same time the Forest Inspector visited the Cooperstown Harvest Home meeting and addressed the audience on the subject of forests and forestry. He went from Franklin to Titusville on the second of September, to view several thousand acres of young timberland scattered in that region. The owner was unable to go with the inspector over the tracts, but a discussion was had thereon with him and recommendations made for their future treatment. On the return visit he met Mr. James H. Duff, the owner of some land in Westmoreland county, but it was impossible to go out to visit this tract on this trip.

Mr. Henry W. Shoemaker, one of the strongest friends of Pennsylvania forestry within the bounds of the State, had often expressed a wish to see more of the forestry work carried on by the Department. On the 6th of September Mr. Wirt accompanied Mr. Shoemaker to the State Forests at Mont Alto and Caledonia, and the forest operations being conducted there were carefully studied.

It was desired to have the Forestry Exhibit installed at the Farmers' Picnic and Annual Grange Encampment at Centre Hall during a week in September, 1912. For this purpose, Mr. Wirt installed the Department exhibit and was assisted by Foresters Mueller, Meek, and Seltzer.

On September 22d and 23d, Mr. Wirt went to Endeavor, Forest county, where the primeval timber of Hon. N. P. Wheeler is the wonder of all the neighborhood. Here Mr. Wirt again met Mr. Shoemaker and a very interesting study of the Wheeler tracts was made. A number of important photographs were obtained.

Mr. Francis R. Cope, Jr., of Dimock, Susquehanna county, desired advice respecting the 200 acres of woodland near that place. A careful study of the situation was made and report thereon rendered to the owner.

On November 1, 1912, the illustrated lecture before referred to was delivered to the students of Lehigh. On this visit an inspection was made of the transplant nursery maintained by the Moravian Congregation at Nazareth. The lands belonging to this congregation had previously been inspected and report made thereon. The trees in their small nursery were found to be making satisfactory growth.

An address on "The Relation of Forests to Water Supply and Agriculture" was delivered by Mr. Wirt to the students of the Messiah Bible School at Grantham, Cumberland county, on November 8th.

Dr. J. N. Rhodes of Philadelphia desired advice respecting the handling of his tract of virgin forest in Delaware county. Such information as was at hand and believed to be applicable to the present conditions was given to the owner by the inspector.

On the same visit an examination of the Farnham Estate of 60 acres near Media was also made and report rendered thereon. The chief trouble here was found to be the chestnut bark disease.

At the request of Miss Hall, an English walnut tree in the borough of West Chester was examined on the same trip, and Mr. Wirt made certain recommendations respecting its treatment.

The Childrens' Country Week Association of Philadelphia owns some farmland near Downingtown and requested certain assistance respecting the handling of their woods. A study of the woodland was made on the 11th of December and report rendered thereon.

On January 13, 1913, Mr. Wirt went to Ansonia, Tioga county, to examine the amount and condition of the standing timber on warrant 4447, along Pine Creek. This examination was made in company with two of the foresters and a forest ranger. The report rendered thereon is one of much detail, and showed a stand of the following character:

Good white pine,	2,022,500 feet
Defective white pine,	752,500 feet
Good hemlock	409,500 feet
Defective hemlock,	145,500 feet

In addition to the above, there are probably 750,000 feet of scattered hardwoods upon the area. The report recommended that all hardwood trees over 8 inches be cut because of the damage they had suffered from a fire occurring forty years ago.

The Association of Eastern Foresters held their winter meeting at Lakewood, New Jersey, and on the 6th of January Mr. Wirt attended as the representative of this Department. The foresters were the guests of the President of the National Conservation Congress, Mr. Charles L. Pack.

An address was given by him to the students of the Forest Academy at Mont Alto on the "Early Days and Development of the State Forest Academy."

On February 4th, a visit was made to Forester Strobeck at Cresco, and an examination made of tracts 59 and 61, Monroe county, where it was proposed to undertake improvement operations; also upon

a tract to the south in Pike county. A clean cutting operation was recommended. A further account of these operations was rendered by Forester Strobeck.

On February 6th a meeting was had with Dr. Wm. R. Fisher and Mr. J. A. Seguire at Cresco, representatives of the Pocono Fire Protective Association. A general discussion was had with them respecting the aims and purposes of the association and the co-operative work which can and ought to be entered into between the Department and their association. As a result of this conference there was prepared a bill which was introduced into the Legislature, passed, and approved, providing for just such co-operation as was deemed advisable between the Department and such associations.

A Chautauqua Circle at Buckingham, Bucks county, requested information respecting Pennsylvania forestry, and on February 15th Mr. Wirt delivered an address to them on this subject.

On March 3d an examination of a large tract of timberland in Lancaster county was made for Mr. J. H. Steinman by Inspector Wirt, Forester W. G. Conklin, and Ranger Wirth. The land is located near Martic Forge. The chestnut was found to be badly infected and other improvements were shown to be needed.

On March 5th a tract of woodland was examined for Dr. Robert Meade Smith of Gwynedd, Montgomery county. Trees that were found to be of no further use were marked for removal.

Requests began accumulating about this time for rules relating to the cutting of timber, and a few general rules were therefore prepared and are given at the end of this report.

At the request of Mr. R. A. Zentmyer of Tyrone, a visit was made on March 18th to the Pennsylvania Furnace Club property at Pennsylvania Furnace. The proposition here was the thinning and management of a Norway spruce and European larch plantation, 50 years of age. Recommendations were made respecting the treatment of their trees.

Through the efforts of Forester A. E. Rupp, a meeting was held at Lemasters, Franklin county, where a lecture was delivered by Mr. Wirt on March 26th, using the subject "Forestry in Pennsylvania."

Mr. A. B. Holmes of McKeesport, being greatly interested in a newly planted park, desired some assistance and advice respecting the trees. For this purpose a visit was made to the plantation on April 7, 1913.

On April 8th, at the request of the Women's Club of Irwin, Westmoreland county, an illustrated talk was given to the school children on the subject of "Tree Buds, Leaves, and Flowers." About 600 children were present at the meeting. In the evening an illustrated talk

on the subject of "Forest and City Tree Planting" was given to about 200 of the older citizens of the town. A number of suggestions for improvement in tree planting were made to interested persons.

Mr. A. P. Cameron, General Supt. of the Westmoreland Coal Company, wished an inspection of his plantation of locust and catalpa made by the company in 1907, near Export. This inspection was made on April 9th. It was found that the company had planted 156 acres. The trees were seedlings one year old and set 6x8 feet. This distance is believed to be too great. The trees averaged about 8 feet in height and from one to two inches in diameter. About 95% of the trees planted were found growing. The locust borer was found but was not abundant. The catalpa was behind the locust in size.

In this visit an examination was made of the lands belonging to Mr. James H. Duff near Newlinburg, Westmoreland county. Instructions were given and written report rendered.

On April 10th, at the request of Mr. S. R. Wilson of the Pittsburgh Coal Company, the Farm Manager of the company, Mr. Bigger, conducted Mr. Wirt over the company's farms near Monongahela City. An effort is to be made to plant the surface lands belonging to the coal company.

Mr. Charles C. Cooper, the resident director of the Kingsley House Association of Pittsburgh, requested an inspection of the woodland on the Lillian Home farm near Valencia, Butler county. This inspection was made April 11th. The tract was found to be valuable both as a source of wood and a protection to buildings. The necessary recommendations were made looking to the beautifying of the region, as well as an increase in its utility.

At the request of Mr. Fred Krebbs of the Cambria Iron and Steel Company of Johnstown, a visit was made to a woodlot near Ebensburg, April 12th. The necessary instructions were given to enable the owner to carry out his desires. At the same time a visit was made to the woodland belonging to the town of Ebensburg, in which are located the springs and through which the stream flows furnishing the town's water supply. The opportunity here for establishing a municipal forest was found to be of the finest. Few towns in this State are so situate.

On April 14, 1913, an examination was made of the 2,300 acres belonging to the Bedford Springs Company at Bedford. The famous Bedford Springs hotel is located on this tract. General improvement of the woodland was desired as well as protection to the springs. The necessary improvement was suggested and the ways of doing it pointed out.

On April 16, 1913, a meeting of the Review Board of the Chestnut Blight Commission made final examination of the experiments at the

Lovett orchard. It was found that in no case had the alleged remedies effected a cure nor did they seem to have lessened the virulence of the attack of the bark disease. Many trees so treated had died. It was found that a slight increase in growth was the only result of the treatment.

On April 17th, an examination was made of a fir on the farm of Col. Cyrus Radford of the United States Marine Corps near Berwyn. The trouble, so far as could be learned, was due to weather conditions, and suggestions for improvement were made.

At the request of the Civic Club of Apollo, two addresses were delivered on the subject of forestry and tree planting to their members on April 25th. The ladies composing this club are greatly interested in beautifying the town with proper tree planting, and took this occasion to arouse interest. On this occasion it was realized that the moving picture film could be made a valuable adjunct to teaching lessons in practical forestry.

The Forestry Exhibit held at Horticultural Hall, Philadelphia, during the week beginning May 19th, was attended by Inspector Wirt and Foresters McNeal, W. G. Conklin, and Mustin. After the exhibit the material was carefully packed and returned to Harrisburg.

On May 27th, in company with S. B. Detwiler of the Chestnut Blight Commission, Mr. Wirt visited the farm of Mr. Musser near Somerset, whose woodland had been damaged by fire resulting from the destruction of blighted chestnut trees. A report to the Chestnut Blight Commission was rendered thereon.

In the interval of inspection, Mr. Wirt was engaged in studying the dying of the Norway spruce at Elizabethtown on the Masonic Home grounds, and comparing information respecting the prevention of forest fires and the planting of various kinds of seeds and seedlings.

On July 31st, at the request of the New Jersey Zinc Company, a visit was made to their New York City office. The purpose of the visit was to consult with the officers of the company respecting the employment of a forester for their lands, at Palmerton, Carbon county, to which a visit of inspection had been made last year. It resulted in the recommendation of John W. Seltzer, a Pennsylvania forester, who was then in the employ of the Davy Institute of Tree Surgery. Mr. Seltzer afterward was appointed to the position and is still serving in that capacity.

The Lincoln International Chautauqua Association desired a talk on forestry at their meeting in Smethport, McKean county, and on August 5th Mr. Wirt was present for this purpose, delivering an address on the subject of general conservation and an illustrated talk on Pennsylvania Forestry. From this place he went to Franklinville, N. Y., where a similar talk on Forest Preservation was given.

On August 8th an inspection of the woodland belonging to Messrs. F. M. Cresson and Caleb Cresson, Jr., was made, in company with the Deputy Commissioner, at Oaks. The advantages and disadvantages of the situation were explained to the owners and a written report rendered to them later.

The summer meeting of the Pennsylvania foresters was held this year at Mont Alto, and on August 12th the Forest Inspector met the foresters and delivered to them an address on the early forest work at Mont Alto. At the same time Dr. Rothrock reviewed his early work in forestry and Prof. Roth of Michigan University spoke on "The Development of Forestry in the United States." Various plantations and other operations were visited and studied. Valuable data are now available as a result of this work and it should be collected and made available as soon as possible.

On August 21, 1913, Mr. Wirt, in company with Foresters McNeal and Mustin, went to Pittsburgh to install the Department exhibit in the buildings of the Western Pennsylvania Exposition Society. Mr. McNeal and Mr. Mustin remained in Pittsburgh to the close of the exhibit, October 18th.

On the 9th of October a small tract of land near Tamaqua was inspected and assistance rendered. This land had been donated to the local civic club for park purposes. At the same time a visit was made to the State Hospital at Coaldale, and plans were discussed relating to the planting of the hospital grounds with forest tree seedlings.

On the invitation of Mr. Herbert R. Green and Mr. Henry Green of Reading, an inspection was made on October 10th of lands lying on Mt. Penn and Mt. Neversink near Reading. The owners have in mind the development of the mountains as a part of the suburbs of Reading. Suggestions were made to the owners, but all matters of this character are now in the hands of the City Planning Commission.

On the same day a visit was made to the property of the Galen Mountain Company near Wernersville, where a study was made of their tract of red cedar and juniper. Suggestions were made respecting the treatment of the woods and the handling of the tract and a written report rendered.

On October 15th an examination was made of a 20-acre tract of land belonging to Hon. Richmond L. Jones of Reading. Mr. Jones is a member of the Valley Forge Park Commission. It is the desire of the owner to maintain the tract in forest growth and to this end introduce some new trees, principally oaks.

On October 16th an examination was made of a 200-acre tract at Summerville for Mr. T. A. Eshleman. The woodland was found to be in need of improvement and the necessary recommendations were

made to the owner. Thence to Redbank and Pittsburgh, where the Forest Inspector was in attendance at the exhibit of the Department maintained at the exposition, and helped to repack material and ship it back to Harrisburg.

On November 11th, in company with the Commissioner of Forestry, the Deputy Commissioner, and a representative of the United States Forest Service, an inspection was made at Mt. Gretna to determine the condition of railroad ties, posts, and rails affected with chestnut blight. The ties were laid under the tracks of the Cornwall and Lebanon Railroad, and the posts and rails were planted in a field belonging to Mr. E. A. Weimer. This experiment is to determine the effect of the fungous disease upon such materials in ordinary use, and to learn whether or not the disease is detrimental to material capable of such use. To date the experiment showed that the wood is in no worse condition than the checks which were free of the disease.

At the request of members of the P. O. S. of A. at Mont Alto, an address was delivered to this order on the evening of December 10th, the subject being "General Conservation and the Prevention of Waste."

In addition to the work of inspection and writing reports on the result of his studies, the Forest Inspector has examined numerous tracts of land which have been offered for sale to the Commonwealth, has assisted the foresters in their work, has helped to make estimates of standing timber on State land, has revised the forms in use in the Department, originated several designs for posters, stickers, and advertising material, and assisted with such technical work as came to hand. He has given considerable time to the study of classification of the work of the Department and submits an outline relating to the creation of bureaus to care for specific divisions of the work of the Department. As a result of the recommendations made, a number of them have been put into practice and are found to be working satisfactorily. The suggestions and recommendations are as follows:

In the Matter of the Creation of Bureaus to Care for Specific Divisions of Work in the Department of Forestry.

1. Utilization: To include a wood survey of the State and all data respecting the demand for the use of wood by wood-using industries.
2. Education and Cooperation: To include everything relating to the library, the forestry exhibit, photographs, items for the newspapers, and the collection of statistics relating not only to Pennsylvania, but to other states and to the United States.

3. **Inspection and Reserve Management:** To include and supervise some system of bookkeeping, as a card system, and to be introduced systematically on the reserves, and to furnish the necessary material for doing bookkeeping; and assistance to the foresters in doing the work.

The following items of general forest management ought to be acted upon without delay, and are necessarily precedent to any of the activities mentioned above:

- (a) The naming of the reserves and establishing temporary boundaries until surveys can be completed, and then the definite marking of the exterior boundary.
 - (b) The making of a forest map of the State, to be done upon a plan somewhat similar to that which was employed by the Pittsburgh Flood Commission in the western counties.
 - (c) A division of the State into districts with a district forester located at some prominent point in each district, who shall concern himself with all material of education, the collection of data, the keeping of the forest map to date, cooperate in fire protection, the inspection of the work of fire wardens, to be at the head of the Department's fire patrol service in his district, and to have general charge and oversight of the auxiliary forest reserves.
 - (d) To devise a new system of filing letters, to be filed by individuals and cross referenced according to subject, using carbon copies instead of our present letter copying books.
 - (e) Reports and correspondence relating to reserves to be filed in connection with the records of each reserve.
4. **Protection:** To include everything relating to fire and fire wardens, grazing, insects, fungi, birds, and parasites.
 5. **Silviculture and Mensuration:** To have charge and oversight of the experimental plots, growth data, nursery inspection, classification, and plant life of the State as related to its forests; also the prosecution of a systematic forest survey of the reserves, and making of stock maps, and the collection of necessary data in relation thereto.

I. C. W. from notes of G. H. W.

June, 1912.

For a considerable time Mr. Wirt has been engaged in making a study of systems in vogue in the office, and on July 30th, 1912, ren-

dered a report looking to a more orderly conduct of the Department routine. The report as submitted on this branch of his work is as follows:

"This Department has been in the lead in forestry work for a considerable length of time, but it is now at a stage when much more active work and at the same time broader work must be done. The Department has continually stood for the idea that forestry is a business. That is true, both in the forest and in the administrative duties of the Department. There is every reason, then, why the Department should keep abreast of the times in business methods both in the office and in the management of the reserves. At the same time it must prepare to meet the broader field opening before it. No better time can be found than the present, for every month lost now means that much more difficulty in adjusting back records to such forms that they may be of most value in the future.

"New System of Office Letter Filing.

"The methods of filing letters and papers in this office are not consistent with the best devised methods. They are cumbersome and very inconvenient for rapid use. Letters should be filed alphabetically instead of according to date. Carbon copies of letters should be made instead of using a copy press book, so that a letter and its reply may be filed together, and at any time the complete correspondence with any individual or on any subject may be instantly found and consecutively followed without referring to several letter books and an indefinite search for original letters.

"Naming of Reserves and Filing Material Relating Thereto.

"For a better handling of reserve correspondence, reports, etc., it is most important that the reservation lands be considered carefully and reserves determined and named. It is recognized that the boundaries and probably the name may be temporary; nevertheless, something definite for the present should be adopted. In the future it will be a simple matter of bookkeeping to shift accounts and records. Under present conditions definiteness is lacking in some locations. Duplicate charges, duplicate records, and omissions are likely to result. A separate file should be had for reserve material together with its own index.

"Explanation to Accompany Forms.

"A business cannot be most successful without system in its accounts and records, and even though a perfect system is elaborated, the men who are expected to use it must understand what is wanted. The Department now has a great many forms which its foresters are expected to use. Lack of adequate explanation defeats their purpose, namely uniformity. It is necessary that a set of instructions be printed at once to accompany these forms, and then a system of inspection and checks to see that the instructions are carried out.

"Keeping of Records on Reserves.

"In this connection it becomes necessary to insist upon records of all transactions occurring on a reserve being kept in the office of the forester on the reserve. Forms and explanations may be furnished, but this is not enough. A cabinet should be furnished in which papers may be kept and this file should correspond to the system used in the Department offices.

"A system of accounting has been formulated and will be presented in detail. This system should be considered immediately and put into force, the necessary supplies obtained and put into the hands of the foresters.

"Bureaus in Department.

"For a broader development of the Department efforts, it is recommended that there be certain bureaus established to develop and push work of particular kinds.

I. Inspection of Private Tracts and Reserve Management.

"The difficulty with the majority of the foresters in the field has been that they have been at a loss, as beginners, to know just what and how to do on their respective reserves. There has been plenty of sympathy and leniency with them, but that does not help them with their work. It only makes it harder for them to make good. The work is new to most Americans and at best is disheartening. Instead of turning a forester loose on a reserve, conditions should have been studied by one of wider experience, and work assigned definitely until the young man can find himself. When work has been planned or sanctioned, the Department should make every effort to supply necessary instruments and then it should hold the forester strictly to account for the proper care of the instruments and the successful issue of the operations.

"The present forest inspector should be assigned to this work, being given necessary authority in the matter, and required, of course, to make detailed reports of exact conditions and needs as he finds them. In this bureau would be developed as rapidly as sufficient data were collected, short period working plans of reserves or at least it would pass upon working plans submitted by the foresters so that a consistent forest policy may be adhered to.

"II. Education and Cooperation.

"Already a scheme for an educational bureau has been presented. This phase of our work is fundamentally important and must not be delayed longer. We cannot expect the people to get forestry knowledge of their own accord. The facts must be presented to them, and it is far better that they be educated along proper lines than to be misinformed as is so frequently the case.

"This bureau could cooperate with the Forestry Association, Conservation Association, Women's Clubs, and other organizations along forestry lines, and systematize the efforts now being put forth at random. Further, through this bureau could be developed the idea

of cooperative management of woodlots among farmers and other small owners, or even among the larger owners, bringing to their attention that the Department is willing to assist them free of charge.

"III. Silviculture and Mensuration.

"For a proper consideration and formulation of plans of forest management it is necessary to know what is on the reserves. At the present time the Department does not fully know what property it has under its direction. Generalities should stop. It is important that we get down to facts and then there is a foundation for work. A forester, under present conditions, cannot make a satisfactory survey and collect the necessary data. One man can't do the work, and the rangers are not capable of rendering all the assistance necessary. It would be an unnecessary expense to buy enough instruments so that each forester would have a set, but by obtaining the best instruments possible for this bureau the forester in charge could begin at once and with the foresters in the field work over the reserves, obtain the required data, and make the required forest maps in the draughting room here at headquarters. Further, this would insure uniformity, which is important.

"Silvicultural data of all kinds are lacking or so scattered as to be of little value without a great loss of time to every one wanting the information. Sample plots are being established on our reserves, and data collected there should be systematized and classified. This bureau could take charge of such data and put them into usable shape. Further, it could obtain satisfactory information along many desirable silvicultural lines by keeping in touch with naturalists, botanists, and students generally all over the State.

"IV. Utilization and Forest Map of State.

"For the last twenty-five years there has been an active forestry propaganda in this State and there has been and is still great talk about the destruction of forests, how much there was to start with, and how much there is now, and how long what is left will last. All this matter has been largely guess work. Our Department represents an important part of the government. We believe we have grounds for existence, but what are they? We suppose that there is an economic reason for the Department. The old idea that a forest map of the State could not be completed before it would be out of date no longer holds. With the force at the disposal of the Department such a map could be made in a short time, and each year with little difficulty and expense, kept to date.

"Further, if our Department is to be of real service in the conservation of forests, a very practical line of work for it is to get wood utilizers and wood growers together to the advantage of both, and to the public at large. It is well known that what is waste at one plant might be used very profitably at another, and that what is wasted at certain forests and mills might profitably be used if a market were known for it. Also, that if certain individuals knew where raw material could be found they would put up establishments in those neighborhoods. This indicates not only a forest survey of the State but a wood utilizing survey as well. If this line of action were explained

to business men, it is believed that their earnest cooperation could be obtained and the movement could not help but bring satisfactory results to the Department.

"V Forest Protection.

"Protection of forests always has been and always will be one of the most important features of a State's forest policy. Forest fires are the curse which brings disease, insects, adverse conditions with reference to stream flow, and destruction of forests either directly or indirectly. It has been a subject of forest legislation for a longer period than any other phase of the work, and yet today we are still groping for a solution to the problem. To begin with, protection should mean protection, not simply attack and extinction with consequent damage to be suffered. Fires cannot be prevented entirely, but they can be prevented from becoming large and from doing much damage. The first stage in this work is education as to how fires are started and the damage they do. This work can be handled by the Educational Bureau when data are presented to it as collected by the Protection Bureau. The second stage is a comprehensive system for prevention of fires and rapid attack when they occur, all over the State. Of course, legislation must be provided, but this must come through education. The present fire warden arrangement can be made effective only by using it to the best advantage during fire seasons. This bureau would work out the situations of the wardens with reference to forests to be protected, and see that wardens and assistants were properly located. Here the forest map of the State would be valuable. High points would be chosen upon which watchmen might be stationed, and it is reasonable to suppose that a few dollars spent in this way will save many dollars on fire bills and thousands of dollars in loss. Local organizations could be formed and a better understanding could be had of what is needed and what is to be done in case of fire. Many fire wardens know nothing of fighting fire and little can be expected when neither warden nor employe know what to do except to put in time. This bureau would get in touch with wardens and instruct them in every phase of their work. This bureau would help individual foresters to work out systems of fire protection on the reserves and collect valuable data in this connection for use on lands not belonging to the State.

"Cooperation with railroads, lumbermen, and timber owners generally would be worked up and all phases of this subject studied and an effort made to solve the problems in a practical and cheap way.

"Insects and fungi are constantly on the increase and it is time our Department is getting in shape to handle this work. We cannot leave it to the Zoological Division of the Agricultural Department. It is distinctly a Forest Department work and we must face the public squarely on the matter. Birds are on the decrease because of the fires we let run. Means must be found to propagate insect eating birds within the State and protection must be afforded them so that they will always be present in numbers.

"Parasitic insects must also be bred and distributed. This may appear to be an unneeded step into the future, but the demands are upon us now. The hickories, oaks, maples, pines are being attacked

vigorously and are dying rapidly. People are asking for help and if we are really anxious to save trees and forests, we must soon be ready to meet the attack and if possible prevent future ones. Planting trees will do us no good if we can't protect what we have or expect to have. It will be so much money thrown away.

"At present the Department collects statistics of wood cut and of forest fire losses. The law calls for them, but for other things as well. Until we know what material we have on hand it makes little difference as to how much or how little is used. The fire reports are made by owners who at times underestimate and at times over-estimate the loss occasioned. Not all fires are reported and each loss reported is counted as one fire and then the data are recorded as seems best to those making them up.

"Were these data accurately collected they would be of value taken with other data, as for example, the forest map of the State, the wood utilizing industries, their needs, etc. For the collection of all such data, for the inspection of fire wardens and their work, for carrying on general forestry educational work, for rendering assistance to private individuals, and to take charge of auxiliary forests as rapidly as they are established under the law, or of privately established forests under forestry management by one responsible to this Department which accomplishes the same thing, except assistance in taxes which is offset by assistance in care and protection, the State should be divided into districts according to counties or larger divisions and a representative (forester) of this Department placed in charge. This, too, is going to take an appropriation, but suppose the auxiliary reserve bills pass, how does the Department expect to take care of the work? The condition of affairs now is that forests which are inspected by the present forest inspector are not being cared for according to his instructions because they are too small to stand the expense of an expert, the owners do not have time to superintend the work themselves, or are at a loss to know how to do even with written instructions before them. Likewise, plantations are made, but improperly. Failures result and then the trees and the forestry work in general receive a setback in the community. This proposition should be carefully considered and steps made as soon as possible to put it into effect.

"Any or all of these changes mean additional help in the offices of the Department, and that means more room. This Department can show material gains for everything it has done and if its work is made known and its demands set forth, there is every reason to suppose that satisfactory arrangements can be provided and funds as well."

July 30, 1912.

Following studies thus made for greater efficiency both within the office of the Department, the offices of the foresters, and within the State forests, a schedule of supplies and other necessary material was prepared. From a careful survey of the needs of this service it is believed that this schedule forms a necessary basis of material which should be in the possession of each forester in order that he may be able to do his work with the greatest economy of time and highest efficiency in records and results.

STATEMENT OF SUPPLIES NEEDED BY EACH FORESTER FOR RECORDS AND RECORD FILE.

In order that the business affairs in connection with the management of a forest reserve may be properly and systematically recorded and filed for future reference, it is necessary that the proper material be supplied to each of the foresters by the Department of Forestry. It is not reasonable to expect the forester to have his department affairs in anything like systematic shape nor for all of the foresters to have similar arrangements when each man is allowed to do as he thinks best and is required to furnish material at his own expense. It is, therefore, requested that the following list of supplies be purchased at once for each forester and sent to him with proper instructions concerning the methods which are to be used in his work.

- 1 Library Bureau—"Demi" horizontal unit comprising:
 - 1 Cornice Top unit.
 - 1 Three-drawer 3 x 5 card index unit.
 - 1 Two-drawer 5 x 8 card index unit.
 - 1 Six-drawer Legal Blank unit.
 - 1 One-drawer Correspondence Vertical File unit.
 - 1 One-drawer Legal size Vertical File unit.
 - 1 Low Base unit with castors.
- 1 Set Manila Guides—120 A-Z—Celluloid Tabs cut 5th, 3" x 5", No. 1 grade.
- 1000 Blank 1-3 Ruling—White, Medium weight, 3" x 5" cards.
- 100 Blank Manila Guides cut 3rds, 5" x 8", No. 1 grade.
- 200 Ledger Cards, Medium weight, Two columns for figures on debit and credit sides of centre, rule on both sides—white—5" x 8".
- 500 Ledger Cards, Medium weight, 4 columns for figures at right side of card—ruled on both sides, Blue, 5" x 8".
- 500 Ledger Cards, as next above, Salmon, 5" x 8".
 - 1 Set Manila Guides, letter size, 25 A-Z cut 3rd.
- 100 Right Tab Folders, letter size, medium weight.
 - 50 Blank Manila Guides, cut 3rds, cap size.
- 100 Right Tab Folders, cap size, medium weight.
 - 1 Box Carter's Gossamer Carbon Paper, 8½" x 14".
 - 1 Box Carter's Gossamer Carbon Paper, 8½" x 11".
 - 1 doz. Indelible Pencils.
- 1000 sheets Letter Copy Paper, yellow.
 - 1 Special Ruled Day Book.

1 box W. S. & B. Paragon paper, ruled, No. 3½.

1 box Clips.

G. H. W.

October 28, 1912.

As a result of all his observations and study, the Forest Inspector makes the following recommendations as being among the first needs for the further development of the work of this service:

1. Fully equipped bureaus to handle branches of the Department work.
2. A more careful development and improvement of roads. Public roads within the State forests should be under the care of the Department and the two cents per acre per year paid to road districts should be eliminated.
3. Stock maps should be completed at an early date and data as to the stock collected and put into usable form. Utilization and protection to be proceeded with and developed. Telephones and outlook stations with easy access thereto form the first element in protection.
4. Complete utilization data for the purpose of handling future forest activity and the encouragement of utilization plants either upon the State forests or nearby for the absorption of forest material which cannot bear a high transportation charge.
5. The building of foresters' and rangers' homes in the most advantageous places as rapidly as funds will permit.
6. The placing of some officer directly in charge of the forest fire fighting system and the developing of this system to a higher plane of efficiency.
7. A study of the damage wrought by attacks of insects and fungi and the development of a bureau in the Department having to do with investigations of this kind of work, and a studying out of the means of applying remedies.
8. The advisory care and supervision by the Department of Forestry of large tracts of land in connection with State institutions, particularly wooded areas, so that such land may be brought to its highest productive capacity to yield revenue for State purposes.
9. A free application of the District Forester act, which waits principally upon the necessary means to develop this branch of the service.
10. Improvement and enlargement of the Department's Forestry Exhibit.

11. The publication of a monthly bulletin devoted to educational work in forestry and the use of such other materials as will bring the cause of forestry more prominently before the people. The publication of all the papers of the first Forestry Commission in pamphlet form is recommended.
12. A better system of accounting to be made uniform throughout all State forests.
13. A system of inspection which amounts to the ordinary business follow-up system for the purposes of keeping in more intimate touch with the foresters, rangers, and forest employes.

All the forms in use in the Department following Mr. Wirt's study and recommendations have been revised and many new ones added. An outline for annual reports was prepared and has been sent to all foresters, enabling them to prepare their reports in a manner which shall be uniform for all. From time to time this material will need revision. At present it is included in what is known as Forester's Manual Part I, December 1912.

The checking up of the monthly reports of foresters and rangers and the proper division of time so reported for proper charge and credit in foresters' records, has been undertaken and is now working satisfactorily.

On January 1, 1913, the new system of filing Department correspondence and records was installed. All correspondence relating to a forest is now found under that division. The fire warden correspondence is likewise filed separately and is of ready access.

In the latter part of 1912 a co-operative project with the U. S. Forest Service was developed whereby a study of the wood-using industries of the State was undertaken and will be published by the Department. This will contain valuable data of use to all persons who are employed in the marketing, handling, or manufacture of wood. It will be bulletin or publication No. 9 of the Department.

In January, 1913, Forester R. Lynn Emerick was detailed from his headquarters at Crossfork to the Department to develop certain educational work then being undertaken. W. G. Conklin, forester on the Jacks Mountain Division of the Seven Mountain Forest, was detailed to the office for silvicultural and mensuration work. N. R. McNaughton, Forester at Karthaus, Clearfield county, has collected a large number of measurements of white pine in Cameron county and came to the Department to work up his material in December, 1912. Messrs. Emerick and McNaughton arranged and indexed the photographic negatives and prints in possession of the office, using for this purpose upwards of 3,000 index cards. Copies of all prints

have now been mounted in permanent form upon boards 22 x 28 inches in size, making all photographs by subjects readily accessible.

A distinctly healthy feeling with the various railroad companies of the State has been developed, and many of them have entered heartily into a co-operative effort to prevent forest fires along their right of way and consequent forest destruction. They have very freely put up the warning notices supplied by the Department and posted them freely on railroad property. The D. L. & W. railroad, the B. R. & P., and the B. & O. have each printed facts in their folders and publications respecting the prevention of fire and the losses occasioned by the careless use of fire. Posters and circulars relating to forest fires and forest uses may be had upon application to the Department.

In order that a uniform method of cutting timber might be followed by the foresters in doing improvement work and by contractors removing timber under the direction of foresters, the following rules have been prepared for governing this work:

GENERAL RULES FOR CUTTING TIMBER.

1. All dead and down timber shall be utilized to the fullest extent.
2. All trees which are decaying either at the base or in the top shall be removed.
3. All trees which are badly injured and are likely to decay in the near future shall be removed.
4. Wolf trees or those with large spreading crowns occupying too much ground to the exclusion of others shall be removed.
5. No tree under 12 inches in diameter inside bark at one foot above ground shall be cut unless coming within the classes above.
6. Stumps shall be cut as close to the ground as possible and under no circumstances shall any stump be more than one foot above ground.
7. Felling shall be done by axe and saw, the axe being used for only so much notching as may be necessary.
8. Cutting into lengths shall be done by saw.
9. All trees cut shall be utilized as closely as possible.
10. Tops and branches shall be lopped in such manner that they may come in close contact with the ground. They must not be left in piles or wind rows.

11. Care must be taken not to injure sound young seedlings, saplings, or trees in felling or in any other operation.
12. When a tree is felled it shall be worked up immediately so as to release quickly any young growth upon which it may have fallen.
13. No trees of value shall be used by operators in making roads, bridges, or skidways except by special consent or by reason of payment of full value thereof.
14. Any merchantable material cut and left in the forest shall be paid for in the same manner and at the same rate as that which is removed.

A Statement of the Roads, Trails, and Fire Lanes constructed, opened, or improved by Pennsylvania State Foresters within the State forests from the establishment of the Department to date.

Date.	Miles.	
	Current number.	Total to date.
1901.	26	26
1902.	50	76
1903.	100	176
1904.	75	251
1905.	75	326
1906.	80	406
1907.	125	531
1908.	156	687
1909.	633	1,320
1910.	864	2,184
1911.	1,159.4	3,343.4
1912.	887.01	4,230.41
1913.	1,392.72	5,623.13

SEEDS FOR FOREST AND NURSERY PLANTING.

In the spring of 1912 the following seeds were sent to the foresters named for planting either in the nurseries they maintain or for broadcast and spot planting within the State forests. What of this seed was not collected by the foresters themselves was purchased by the Department.

Forester.	White pine, \$1.30 per pound.		Norway spruce, \$0.75 per pound.		Eur. larch, \$0.85 per pound.		Red pine, \$5.00 per pound.		D. fir, \$2.75 per pound.		Scotch pine, \$1.75 per pound.	
	lbs.	cost.	lbs.	cost.	lbs.	cost.	lbs.	cost.	lbs.	cost.	lbs.	cost.
Ziegler,	350	\$455 00	50	\$37 50	4	\$4 51	10	\$50 00	5	\$13 75	8	\$14 87
Mulford,	350	455 00	50	37 50	10	9 50	20	100 00	5	13 75	8	14 87
Retan,	150	195 00	10	7 50	4	4 51	10	50 00	3	8 25	5	8 75
Conklin, R. G.,	5	6 50	2	1 50				2 50		1 33	1	1 75
Avery,		3 90										
Bastian,	8	10 40								1 33		33
Byers,	3	3 90										
Dague,	25	\$2 50	5	2 75			5	25 00	3	5 25	2	\$ 50
Elliott,	3	3 90										55
Emerick,	10	13 00	3	2 25					2	5 50	2	\$ 50
Evans,	10	13 00										
Jerald,	2	2 60	3	2 25			2	10 00		1 33		88
Kirk,	10	13 00	10	7 50			1	7 50	1	2 75	2	\$ 50
Ludwig,	5	6 50								1 33	1	1 75
McNaughton,	3	3 90										88
Miner,	2	2 60									1	1 75
Morton,	1	1 30										
Rupp,			1	75								88
Seltzer,	3	3 90	3	2 25			1	5 00		1 33	1	1 75
Fox,	5	6 50	3	2 25			1	5 00		1 33	1	1 75
Strobeck,	20	26 00								1 33	1	1 75
Vail,	5	6 50								1 33	1	1 75
Winter,	1	1 30		38						1 33	1	1 75
Mumma,	4	5 20	4	3 00						1 33	1	1 75
Silvins,	3	3 90	1	75						1 33	1	1 75
Smith,	1	1 30		38				1 25		1 33		88
	982		146		20		51		25		41	

Total seeds by weight, 1,265½ pounds.

Seeds were distributed during the year 1913 in like manner to the foresters for the same purpose, as follows:

Forester.	White pine, \$1.35 per pound.		Red pine, \$1.00 per pound.		Pitch pine, \$1.80 per pound.		Norway spruce, \$0.85 per pound.		European larch, \$0.96 per pound.	
	lbs.	cost.	lbs.	cost.	lbs.	cost.	lbs.	cost.	lbs.	cost.
Bietsch,	120	\$162 00					5	\$4 25	10	\$9 60
Ziegler,	275	371 25			7	\$12 60	51	43 77	20	19 00
Mulford,	325	438 75	8	\$34 00	10	18 00	51	69 27	23	21 85
Conklin, R. G.,	6	8 10					2	1 70	1	95
Elliott,	2	2 70								
Emerick,	10	13 50					10	8 50		
Haupt,	2	2 70								
Irvin,	2	2 70					5	4 25	5	4 75
Vail,	4	5 40					1	85	2	1 90
Miner,	2	2 70							1	95
Meek,	2	2 70							1	95
Fox,	2	2 70					2	1 70	2	1 90
Sheeler,	5	6 75					5	4 25	4	3 80
Dague,	20	27 00					2	17 00	10	9 50
Hogentogler,	5	6 75							5	4 75
Kirk,	4	5 40					10	8 50	5	4 75
Ryon,	4	5 40					2	1 70	2	1 90
Silvins,	5	6 75					3	2 55	3	2 85
Mueller,	3	4 05					3	2 55	3	2 85
Winter,	1	1 35					2	1 70	1	95
Conklin, R. S.,	1	1 35								
	300		8		17		203		98	

Total seeds by weight, 1,126½ pounds.

STATE FOREST NURSERIES.

The Mont Alto Nursery, 1912.

On September 1, 1912, Mr. George A. Retan, a graduate of the State Forest Academy, was detached from the Greenwood nursery and placed in charge at Mont Alto nursery. He was also assigned work in the Academy.

Two problems of the Mont Alto nursery are soil and weeds. The heavy clay of a part of the nursery is not yet sufficiently modified and coniferous seedlings do not do well in it, although hardwoods succeed. The breaking down of this heavy soil is begun and will be continued until a better condition is obtained. Green manure and barn-yard manure have been employed in this effort and forest humus is to be added.

The little Brazilian weed, *Galinsoga parviflora*, has taken possession and is difficult to eradicate. The difficulty of the problem is increased because the plant is so common in the neighborhood.

In the autumn 125 bushels of walnuts were planted in the nursery and one-half acre set to white oak acorns. The need at present is hardwood seed. There remains a small area fitted only for growing hardwood seedlings.

The broadcast seed sowing in 1912 has been successful. Little trouble was had with the damping-off fungus, due in part to the removal of the cause. The germination percentage was high and the present stand promises well for 1913. An inventory of the stock based on minimum rather than maximum figures, is as follows, taken in the fall of 1912:

Growing Stock.

Black cherry, 1 year,	2,000
White Oak, 1 year,.....	2,000
Ash, 1 year,	5,000
Black walnut, 1 year,	6,000
Willow cuttings,	5,000
White pine, 2 year,	220,000
Privet cuttings,	6,000
Scotch pine, 2 year,	7,000
Transplants White pine, 1-2 years,	7,000
Norway spruce, 2 year,	72,000

Honey locust, 1 year,	1,500
Sycamore, 1 year,	3,864
Red pine, 1 year,	20,000
Norway spruce, 2-1,	6,000
White pine, 1-1,	6,000
Douglas fir, 1 year,	25,000
White pine, 1 year,	1,500,000
European larch, 1 year,	5,000
The money value of the above stock is \$3,000.00.	

THE MONT ALTO NURSERY, 1913.

Mr. Retan, the forester in charge has been making detailed studies of the raising of a number of particular species. As a result of his studies he submits a report, of which the following contains the essential features:

"A study of the inventory and cost accounts appended will show that the nursery work has not been so successful as last year. This has been due to three very evident causes which are discussed in detail.

"The first of these is poor white pine seed. White pine is the species on which the Department is basing its hopes of successful reforestation and the species which the nurseryman is asked to produce at a low cost per thousand. He cannot do this with poor seed. It costs a certain amount for the twenty ounces of seed used on a bed. It costs one dollar to get this seed to the germination point. It costs \$1.50 to care for that bed during the year. It costs \$1.00 to \$1.50 for that bed for supervision, water system, and capital invested. In other words, that bed costs \$4.00 whether it produces one thousand or ten thousand plants. It must produce 5,000 plants if the bed is to pay for itself. The seed must have a germination percentage of 50-70% to produce these trees and allow for the normal loss. But this is not the end. The long continued careful experiments of investigators have shown that not only the germination percentage is of value, but that the weight and size of the seed influence the growth of the seedling and of the young tree. In other words, the quality of the seed may determine the success or failure of the plantation.

"In buying seed the source, age, storage, and number of grains per pound should be considered. The experiments of Ciesler and others carried on through a period of twenty-five years have proved that seed from other than local sources produces branchy, stunted, poor, trees. So important is this regarded that even European seed dealers acknowledge it and guarantee source as well as germination percentage. Age is self-evidently important. The Forest Service as well as European investigators have found certain definite germination ratios corresponding with age and storage conditions. Haak and

Bates are quoted. In case of germination immediately upon removal from cones, seed drier than air germinates more vigorously. On the other hand, after several months air tight storage, the dry seed will have deteriorated and the moist improved. Seed with a moisture content equal to the normal air content, stored in air tight receptacles, is so much better than seed stored under any other conditions, that this should be the only method followed. Of seed which germinates better, a larger percentage of the germinated plants survive permanent out-planting. Poorer seed produces poorer seedlings.

"Past experience would seem to show that these facts had been disregarded in seed buying. The seed received last year was very dry, the kernel was shrunken and usually yellowish. As a result, germination was slow, uneven, and poor. A large proportion of the seed still appears to be in living condition and may germinate in the spring. If so, this would require holding the beds over another year, and be expensive. The seed received so far this year appears to be similar or even worse, as far as can be ascertained from the cutting test.

"A second cause for failure is found in the soil conditions. This season the poorer portions of the coniferous sections were used. Although green and stable manure had been plowed under on the area, the soil was still far too heavy and stiff. The charcoal was again tried on twenty-two beds in the worst portion with markedly beneficial results. Germination was no better, but the loss has been less and the seedlings are much stockier and have better color. Charcoal will be heavily applied to over one hundred beds the coming season. It is undoubtedly the only known cure for the soil conditions of this nursery. There is a question as to whether the charcoal acts purely in a physical manner or whether a possible ash content aids. The charcoal used this year is pure charcoal from the old furnace pile with no possible ash content and the results will indicate which to use in the future. Pure charcoal can be obtained much more easily and at less expense.

"A third cause for failure is found in the fertilizer experiments directed by the Department. These covered fifty beds, of which twenty beds were so badly damaged that they will fall from two to three thousand seedlings per bed below the checks. This is a loss of at least forty to sixty thousand seedlings, or about a one hundred dollar loss. These experiments would have been better, tried on smaller plots. At least, the application of sodium nitrate as a top dressing was unwise, since an experiment on the one year old plants in this nursery, earlier in the spring, had killed large numbers. I have visited the Greenwood Nursery, comparing results, and find them similar bed for bed.

"The Norway Spruce beds are very fair. Germination was excellent. The latest beds to germinate suffered severely from damping off in a spell of wet weather lasting a whole week, amounting on some beds to as much as 80% of the stand. However, the earlier beds have a good stand and the average is fair. The Larch is also good.

"An experiment in transplanting Black Walnut was tried. It is found that at the end of the second year a large percentage of the tap roots injured in transplanting are decaying. This would indi-





cate that the raising of Black Walnut in the nursery is unwise. The nuts should be planted directly into the permanent site.

"This nursery, as has been pointed out before, is well adapted to raise ash, oak, and other hardwoods. More seed of these species should be sent here from the State forests. This year none has been received.

"The fight against the weed *Galinsoga parviflora* has been vigorously waged. Results cannot be had before another year. The attempt to hold this weed in check was responsible for an increase of \$150 to \$200 over the cost of holding the ordinary weeds in subjection.

"A comparison with last year's report will show about twice as much student labor used. An attempt has been made to have as much work as practicable done by the students, consistent with their other activities. They have done all the different kinds of work.

"A better system of cost keeping has been developed. This is shown in the more complete report appended. To this end a new form has been found advantageous. This can be filed by charges and take the place of a ledger, at the same time giving a history of every section of the nursery throughout the year. We believe this form merits attention. It requires no more labor each day and saves time at the end of the month.

1913 Balance.

Labor, teams and students,	\$1,171 83	
Fixed charges and supervision,	654 22	
Incidental expenses,	97 01	
Seed,	434 78	
1912 charges to 1913 account,	15 30	
Charge to capital,		\$43 10
Carried to 1914 account,		37 41
Shipping, spring of 1913,		93 97
Potatoes,		42 90
Silvicultural experiments,		15 1/2
Foreign seed experiments,		37
1912 white pine, 1913 account,		575 47
Black walnut,		39 05
White oak,		75 95 1/2
White pine transplants 1-1,		4 64
Willows,		18 56 1/2
Privet,		20 32 1/2
White pine and Norway spruce transplants 2-2,		2 38
Norway spruce transplants 1-1,		53 32 1/2
White spruce and Balsam fir,		4 46
Black walnut transplants 1-1,		12 93
White pine, 1913 beds,		1,046 39 1/2
Norway spruce, 1913 beds,		245 46 1/2
Larch, 1913 beds,		47 98 1/2
P. rigida, failure,		5 29
	<u>\$2,373 14</u>	<u>\$2,373 14</u>

Detailed Expenses and Charges.

Fixed Charges and Supervision,	\$654 22	
Forester,		\$400 00
Roads and drains,		9 75
Land,		44 85
Water system,		15 00
Tools,		33 07
Shades and stakes,		144 25
Buildings and grounds,		7 32

Total Overhead Charges,	815 25½	
Fixed charges as above,		654 22
Current Expenses:		
Roads and drains,		28 82
Charcoal,		44
Water system,		3 76
Tools,		10 42
Compost,		20 35
Shades and stakes,		10 13
Buildings and grounds,		82 86½
Bookkeeping supplies,		4 25

Labor, Teams and Students.

(Student labor counted at 14c. per hour.)

	Team.	Students.	Payroll.
March,		\$21 56	
April,	\$5 54	54 97	\$48 46
May,	3 80	91 49	236 40
June,	5 40	34 80	189 75
July,	2 61	17 08	134 56
August,	2 16	31 32	128 40
September,	3 08	36 39	45 56
October,	5 76	9 59	33 28
November,	2 43	11 55	
December,	1 58	13 79	
Unaccounted for,		52	
	\$32 36	\$323 06	\$816 41
Total for year,			\$1,171 83

Inventory and Costs. Ready to Plant.

	Expense 1912.	Expense 1913.
2-yr. Douglas fir, Est. 10,000,	\$18 74	
2-yr. Scotch pine, Est. 2,000,	26 54	
1-yr. White oak Est. 25,000:		
Seed and planting,	23 46	
Cultivation,		\$55 95½
Overhead charges,		20 00
Total		\$99 41½
1 yr. Black walnut, Est. 15,000:		
Seed and planting,	40 71	
Cultivation,		\$19 05
Overhead charges,		20 00
Total cost,		\$79 76
2 yr. White pine, Est. 1,000,000; 1,800 used:		
First year expense,	1,350 00	
Protection,		\$7 82
Weeding,		105 28
Paths,		54 74½
Overhead charges,		407 62½
Total cost,		\$1,925 47
2 yr. White pine ½ Trans. Est. 2,000.....}		
Norway spruce ½ Trans. Est. 2,000,...}Mixed,	19 69	\$2 38
Cost to date,		\$22 07
2 yr. Black walnut 1-1 Trans. Est. 3,000,	\$15 00	
Transplanting and cultivation,		\$12 93
Cost to date,		\$27 93

	Expense 1912.	Expense 1913.
2 yr. Sycamore, Est. 3,000,	4 34	.....
2 yr. European larch, Est. 3,500 now in bed; 1,800 shipped and used; total, 5,300,	23 28	.....

To Remain in Nursery.

1 yr. Norway spruce, 52 beds 100 sq. ft., Est. 250,000:		
Making beds and mulching,		\$48 68½
Protection,		7 63
Weeding,		81 67
Seed,		43 78
Winter covering,		5 93
Overhead charges,		57 77
Total to date,		<u>\$245 46½</u>
1 yr. European Larch, 10 beds 100 sq. ft., Est. 30,000:		
Making beds and mulching,		\$10 08
Protection,		34½
Weeding,		6 85
Seed,		19 00
Winter covering,		81
Overhead charges,		10 90
Total to date,		<u>\$47 98½</u>
1 yr. White pine 228 beds, Est. 400,000:		
Making, sowing, and mulching,		\$245 18½
Protection,		10 11½
Weeding,		132 30½
Paths,		16 38
Seed,		372 00
Covering for winter,		21 45
Overhead charges,		248 96
Total to date,		<u>\$1,046 39½</u>
2 yr. Norway spruce 1-1 Trans. Est. 4,000; 20,000 transplanted, Heavy loss because of dwarfed root systems,		\$53 32½
2 yr. White pine 1-1 Trans. Est. 1,000; 2 yr. seedlings—culls from 1912 area Est. 100,000—to be transplanted spring 1914,		<u>4 64</u>
Willows:		
Previous charges,		\$21 69
1913 charges,		18 56½
Credit by 44,800 cuttings at 60c,	26 88	
Credit by 44,800 cuttings at 60c,	26 88	\$40 25½
Carried to 1914,		<u>\$13,37½</u>
Privet:		
Est. 5,000 roots,		\$20 32½
Total previous charges,	\$107 57	
Total,		<u>\$127 89½</u>
Credit by:		
R. S. Conklin, 875 plants at \$5.00,	4 38	
E. A. Ziegler, 250 plants at \$5.00,	1 25	
N. R. McNaughton, 200 plants at \$5.00,	1 00	
Nursery 5,000 at \$5.00 to Capital under Grounds,	25 00	
		31 63
Total cost carried forward,		<u>\$96 26½</u>

The nursery inventory as of December, 1913, shows the following stock to be on hand:

Hardwoods suitable for 1914 planting:

Walnut, 1 year,	15,000
White oak, 1 year,	25,000
Walnut, 1-1 year,	3,000
Sycamore, 2 years,	3,000

Conifers suitable for 1914 planting:

European larch, 2 years,	3,500
Scotch pine, 2 years,	2,000
Norway spruce, 1-2 year,	2,000
White pine, 1-2 year,	2,000
Douglas fir, 2 years,	10,000
White pine, 2 years,	1,000,000

Also the following seedlings suitable for forest planting after 1914:

Norway spruce, 1 year,	250,000
Norway spruce, 1-1 year,	4,000
White pine, 1 year,	400,000
White pine, 2 years,	100,000
White pine, 1-1 year,	1,000
European larch, 1 year,	30,000

In addition to the above there is on hand a large stock of privet and willow suitable for cuttings or root plants.

Shipments from this nursery are shown elsewhere in the report on "State Forest Planting."

THE GREENWOOD NURSERY, 1912.

The nursery in this division was established in 1906, at which time it was not more than one-fourth of an acre in extent. It has since been enlarged to $2\frac{1}{2}$ acres. An inventory of the seedlings in the nursery at the end of the growing season for 1912, is as follows:

White pine, 3 years,	60,000	
White pine, 2 years,	460,000	
White pine, 1 year,	600,000	
Red pine, 2 years,	14,000	
Red pine, 1 year,	50,000	
Scotch pine, 2 years,	50,000	
Scotch pine, 1 year,	15,000	
Norway spruce, 1 year,	40,000	
European larch, 1 year,	10,000	1,299,000

Shipments from this nursery are shown elsewhere in the report on "State Forest Planting."

THE GREENWOOD NURSERY, 1913.

This year the nursery was enlarged to 3 acres. It is divided into 6 sections, and with the water system each section may be treated separately. Fertilizer experiments outlined by Prof. Netoffsky are being carried on. The seedlings available for planting from this nursery in the spring of 1914, are as follows:

White pine, 2 years,	400,000	
Red pine, 2 years,	40,000	
Scotch pine, 2 years,	10,000	
Norway spruce, 2 years,	20,000	
European larch, 2 years,	6,000	
White pine, 2-1 years,	11,000	
Red pine, 2-1 years,	9,500	
Scotch pine, 2-1 years,	3,000	
Black walnut, 1 year,	8,300	
California privet,	5,430	
Black cherry,	170	513,400

The least cost for growing any of the above per thousand is \$1.58 for the two year old red pines. The greatest cost is \$5.09 per thousand for the black walnut.

THE ASAPH NURSERY, 1912.

The Asaph Forest Nursery is located within the Stone State forest, Asaph division, forester Mulford being in charge. On April 1st, 1907, it was begun with an area of 5 acres, 2½ being under cultivation that year. It has since been enlarged to 20 acres, with 13 now under cultivation.

The seed planted in this nursery during the year, was as follows:

European larch,	10 pounds.
White spruce,	50 pounds.
Red pine,	20 pounds.
White pine,	356¼ pounds.
Scotch pine,	8 pounds.
Douglas fir,	5 pounds.
Sugar maple,	208 pounds.
Chestnut,	45 pounds.
White ash,	834 pounds.
Honey locust,	4¼ pounds.
Black walnut,	2 bushels.
Red elm,	3½ pounds.
Black cherry,	315½ pounds.

At the end of the 1912 growing season an inventory of seedlings in the nursery shows the following stock on hand. The count was made by beds, or square foot rule, and an estimate made from the averages:

White pine, 1 year,	1,256,215
Norway spruce, 1 year,	95,000
Red pine, 1 year,	54,000
Douglas fir, 1 year,	32,000
Scotch pine, 1 year,	60,000
European larch, 1 year,	12,000
Honey locust, 1 year,	3,500
Black walnut, 1 year,	700
White ash, 1 year,	24,000
White pine, 2 years,	912,000
Norway spruce, 1-1,	2,107

Norway spruce, 2 years,	119,000	
Pitch pine, 2 years,	9,500	
Red pine, 2 years,	36,300	
European larch, 2 years,	9,200	
Scotch pine, 2 years,	35,000	
White oak, 2 years,	234	
Sugar maple, 2 years,	7,000	
White pine, 1-1,	24,157	
Silver pine, 3 years,	35,500	
White pine, 3 years,	927,420	
Norway spruce, 3 years,	58,000	
White pine, 2-1 years,	708,270	
Norway spruce, 2-1 years,	38,234	
White pine, 5 years,	500	
Balsam fir, 5 years,	75	4,459,912

The seedlings shipped out of the nursery during the current year for planting upon other State forests and to private individuals, purchased at cost according to law, represent a value of \$3,521.96, including \$67.41 for packing and cartage charges. The seedlings so supplied were as follows:

Honey locust, 1-yr., at.....	\$1 19	3,400	\$4 04
Honey locust, 1-yr. at.....	2 50	2,000	5 00
Red oak, 1-yr., at.....	2 82	20,650	58 23
Black cherry, 1-yr., at.....	3 29	1,407	4 62
Elm, 2-yr., at.....	2 13	21,350	45 43
Sugar maple, 2-yr., at.....	2 00	200	40
Sugar maple, 2-yr., at.....	2 50	1,320	3 30
Norway spruce, at.....	3 00	25,000	75 00
European larch, 2-yr., at.....	3 00	200	60
European larch, 2-yr., at.....	5 00	11,125	55 63
Scotch pine, 2-yr., at.....	2 00	13,500	36 90
White ash, 2-yr., at.....	2 00	2,347	4 69
White ash, 2-yr., at.....	2 50	200	50
White pine, 2-yr., at.....	1 89	101,700	192 21
White oak, 2-yr., at.....	4 50	250	1 13
White pine, 3-yr., at.....	2 75	1,000	2 75
White pine, 3-yr., at.....	2 89	506,400	1,463 58
Scotch pine, 3-yr., at.....	3 00	300	90
Norway spruce, 3-yr., at.....	4 00	30,500	122 00
European larch, 3-yr., at.....	7 00	1,909	13 30
White ash, 3-yr., a.....	2 00	131	26
White pine, 2-1 yr., at.....	3 10	15,000	46 50
White pine, 2-1 yr., at.....	6 31	192,900	1,218 20
Norway spruce, 2-1 yr., at.....	3 00	7,000	21 00
Norway spruce, 2-1 yr., at.....	5 00	14,350	71 75
Scotch pine, 2-1 yr., at.....	2 50	200	50
Scotch pine, 2-1 yr., at.....	3 00	1,300	3 90
Norway spruce, 4-yr., at.....	8 25	270	2 23
Total,		975 900	\$3,454 55
Packing and cartage charges,			67 41
			<u>\$3,521 96</u>

The number of seedlings available from this nursery for spring planting in 1913 is as follows:

Honey locust, 1 year,	3,000	
Black walnut, 1 year,	700	
Scotch pine, 2 year,	35,000	
Sugar maple, 2 year,	6,500	
European larch, 2 year,	9,200	
Silver pine, 3 year,	35,500	
White pine, 3 year,	927,420	
Norway spruce, 3 year,	58,000	
White pine, 2-1 year,	566,616	
Norway spruce, 2-1 year,	30,587	
White pine, 5 year,	500	
Balsam fir, 5 year,	75	1,673,098

THE ASAPH NURSERY, 1913.

This nursery was enlarged in 1913 to 33 acres, 20 acres of which were set with seedlings, 8 acres planted with seeds, and 5 acres under cultivation. An inventory of the seedlings by species and age shows the following stock on hand:

White pine, 1 year,	936,609
Norway spruce, 1 year,	946,533
Red pine, 1 year,	57,760
European larch, 1 year,	33,789
Pitch pine, 1 year,	43,136
Honey locust, 1 year,	16,025
Sugar maple, 1 year,	2,715
Black cherry, 1 year,	10,380
White ash, 1 year,	15,000
Black walnut, 1 year,	569
Chinese chestnut, 1 year,	164
Elm, 1 year,	809
White pine, 2 year,	1,004,972
Scotch pine, 2 year,	42,000
Norway spruce, 2 year,	38,000
Red pine, 2 year,	42,000
European larch, 2 year,	10,476
Douglas fir, 2 year,	25,600
Black walnut, 2 year,	94

Sugar maple, 2 year,	310	
White pine, 2-1,	102,128	
White pine, 1-2,	5,093	
Norway spruce, 1-2,	1,689	
Scotch pine, 4 year, transplanted,	70	
White pine, 6 year, transplanted,	450	
Balsam fir, 6 year, transplanted,	35	3,336,406

The seedlings available for spring planting in 1914 from this nursery are distributed among the following species:

Honey locust, 1 year,	16,025	
Black cherry, 1 year,	10,380	
Black walnut, 1 year,	569	
Elm, 1 year,	809	
Chinese chestnut, 1 year,	164	
Sugar maple, 1 year,	2,715	
Scotch pine, 2 years,	42,000	
Norway spruce, 2 years,	38,000	
Red pine, 2 years,	42,000	
European larch, 2 years,	10,476	
Douglas fir, 2 years,	25,600	
White pine, 2 years,	600,000	
Black walnut, 2 years,	94	
Sugar maple, 2 years,	310	
White pine, 2-1 year,	102,128	
White pine, 1-2 year,	5,093	
Norway spruce, 1-2 year,	1,689	
White pine, 6 year trees,	450	
Balsam fir, 6 year trees,	35	
Scotch pine, 5 year trees,	70	898,607

Because of the unusual season of repeated frosts, and short growing period, these seedlings are the smallest, at same age, ever produced in this nursery.

Shipments from this nursery are shown elsewhere in the report on "State Forest Planting."

The total value of all seedlings shipped from the nursery during the year calculated at nursery cost amounts to \$6,965.92.

The seedlings in the nursery were badly damaged by frosts May 8, 11, and 20; June 9 and 10. The first year conifers showed no new growth until September 3rd.

SMALL EXPERIMENTAL NURSERIES ESTABLISHED BY THE FORESTERS.

These small nurseries heretofore established mainly for object lessons in the neighborhood of State forests are productive of a considerable number of good seedling trees. As to area they are more fully described in the Department report for the years 1910-11, page 115. An inventory of the seedlings contained in these small nurseries stated by forester and locality is as follows:

1912.

Robert G. Conklin, South Mountain Forest, Caledonia Division.

White pine, 1 year,	27,335	
White pine, 1-1 year,	14,578	
White pine, 1-2 year,	18,709	
White pine, 1-3 year,	2,417	
Norway spruce, 1 year,	11,357	
Norway spruce, 1-1 year,	10,498	
Norway spruce, 1-2 year,	10,138	
Douglas fir, 1 year,	5,540	
European larch, 1 year,	872	
European larch, 1-1 year,	275	
Red pine, 1 year,	7,610	
Red pine, 1-1 year,	872	
Scotch pine, 1 year,	12,225	
Scotch pine, 1-1 year,	7,942	
White ash, 1 year,	2,080	
White ash, 1 year,	2,080	132,448

William F. Dague, Clearfield Forest, Clearfield Division.

White pine, 1 year,	175,000	
Norway spruce, 1 year,	20,000	
Norway spruce, 2 year,	12,000	
Douglas fir, 1 year,	10,000	
European larch, 2 year,	1,000	
Red pine, 1 year,	30,000	
Scotch pine, 1 year,	5,000	253,000

R. Lynn Emerick, Kettle Creek Forest, Cross-fork Division.

White pine, 2 year,	27,000	
Blue spruce, 1 year,	15	
Norway spruce, 2 year,	15,000	
Chinese arbor vitae 1 year,	10	
Douglas fir, 1 year,	40,000	
Dwarf mountain pine, 1 year,	50	
Scotch pine, 2 year,	10,000	
Catalpa, 1 year,	25	
Black locust, 1 year,	60	
Russian olive, 1 year,	6	
Persimmon, 1 year,	20	92,186

P. Hartman Fox, Sinnemahoning Forest, Austin Division.

White pine, 1 year,	8,000	
White pine, 2 year,	60,000	
White pine, 1-2 year,	1,300	
Norway spruce, 1 year,	7,000	
Norway spruce, 2 year,	9,000	
Douglas fir, 1 year,	3,000	
Red pine, 1 year,	2,500	
Red pine, 2 year,	2,500	
Scotch pine, 1 year,	8,000	
Scotch pine, 1-1 year,	7,000	108,300

Carl L. Kirk, Clearfield Forest, Penfield Division.

White pine, 1 year,	17,500	
Norway spruce, 1 year,	54,000	
Douglas fir, 1 year,	12,000	
Red pine, 1 year,	37,600	
Scotch pine, 1 year,	8,000	129,100

Harry J. Mueller, Nittany Forest.

White pine, 2 year,	15,000	
White pine, 3 year,	400	
Norway spruce, 2 year,	100	15,500

Alfred E. Rupp, Buchanan Forest.

Norway spruce, 2-2 year,	11,400	
Black walnut, 1 year,	700	12,100

J. B. Ryon, Whetham Forest.

White pine, 1 year,	18,000	
Norway spruce, 1 year,	30,000	
Douglas fir, 1 year,	4,200	52,200

John L. Strobeck, Minisink Forest, Pocono Division.

White pine, 1 year,	75,000	
White pine, 2 year,	4,000	
Norway spruce, 2 year,	15,000	
Douglas fir, 1 year,	4,000	
Scotch pine, 2 year,	10,000	
Black walnut, 1 year,	60	108,060

H. Lawrence Vail, Sinnemahoning Forest, Hull Division.

White pine, 1 year,	9,000	
White pine, 2 year,	1,000	
Norway spruce, 2 year,	200	
Douglas fir, 1 year,	2,200	
Scotch pine, 1 year,	4,250	
Scotch pine, 2 year,	800	17,450

D. Kerr Warfield, Seven Mountain Forest, Kishacoquillas Division.,

White pine, 2 year,	980	
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R. B. Winter, White Deer Forest, McCall Division.

White pine, 2 year,	500	
Norway spruce, 1 year,	500	
Norway spruce, 2 year,	500	
Douglas fir, 1 year,	10,000	
Pitch pine, 2 year,	500	
Scotch pine, 2 year,	100	
Basswood, 1 year,	25	12,125

During the year 1912 the following foresters established new nurseries for experimental purposes, and an inventory of their growing stock shows the following:

Harry E. Elliott, Sinnemahoning Forest.

White pine, 1 year,	5,000	5,000
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Charles R. Meek, Seven Mountain Forest, Poe
Division.

White pine, 1 year,	2,000	
Norway spruce, 1 year,	12,800	
Douglas fir, 1 year,	2,500	
Red pine, 1 year,	2,500	
Scotch pine, 1 year,	4,500	24,300

C. C. Miner, Stone Forest, Chatham Division.

White pine, 1 year,	9,000	
White pine, 2 year,	4,000	
Scotch pine, 1 year,	5,000	18,000

John W. Seltzer, Seven Mountain Forest, Co-
burn Division.

Norway spruce, 1 year,	1,500	
Douglas fir, 1 year,	700	
Red pine, 1 year,	800	3,000

Edgar H. Smith, Bald Eagle Forest.

White pine, 1 year,	8,000	
Norway spruce, 1 year,	8,000	
Douglas fir, 1 year,	10,000	
Red pine, 1 year,	6,000	
Scotch pine, 1 year,	15,000	47,000

John A. Bastian, Loyalsock Forest.

Douglas fir, 1 year,	1,200	1,200
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H. E. Bryner, Pennypacker Forest.

White ash, 2 year,	6,000	6,000
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A. W. Bodine, Rothrock Forest.

Black walnut, 1 year,	2,200	2,200
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Total,		1,040,149
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A summary of the stock found in these nurseries, is as follows:

1912.	
Species.	Number.
White pine,	503,719
Norway spruce,	228,993
Douglas fir,	105,340
European larch,	2,147
Red pine,	90,382
Scotch pine,	97,817
Pitch pine,	500
Dwarf mountain pine,	50
Blue spruce,	15
Chinese arbor vitae,	10
White ash,	8,080
Black walnut,	2,960
Black locust,	60
Basswood,	25
Catalpa,	25
Russian olive,	6
Persimmon,	20
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Total,	1,040,149

1913.

An inventory of stock on hand at the end of the growing season in the experimental nurseries, is as follows:

John A. Bastian, Loyalsock Forest.

Douglas fir, 2 year,	1,200	1,200
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A. W. Bodine, Rothrock Forest.

Black walnut, 1 year,	250	250
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H. E. Bryner, Pennypacker Forest.

White ash, 1 year,	5,600	5,600
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Robert G. Conklin, South Mountain Forest,
Caledonia Division.

White pine, 2 year,	8,000	
Scotch pine, 2 year,	17,000	25,000
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Wm. F. Dague, Clearfield Forest, Clearfield Division.

White pine, 2 year,	205,000	
White pine, 1 year,	135,000	
Red pine, 2 year,	80,000	
Norway spruce, 2 year,	35,000	
Norway spruce, 1 year,	437,000	
Douglas fir, 2 year,	8,000	
European larch, 1 year,	100,000	1,000,000

R. Lynn Emerick, Kettle Creek Forest, Crossfork Division.

White pine, 3 year,	2,340	
Norway spruce, 2 year,	5,300	
Douglas fir, 2 year,	640	8,280

P. Hartman Fox, Sinnemahoning Forest, Austin Division.

White pine, 3-1 year,	22,000	
White pine, 2-1 year,	1,500	
Scotch pine, 3-1 year,	2,000	
Scotch pine, 2-1 year,	750	
Red pine, 3-1 year,	2,000	
Norway spruce, 3-1 year,	10,000	
Norway spruce, 2-1 year,	1,100	
Douglas fir, 2-1 year,	200	39,550

Carl L. Kirk, Clearfield Forest, Penfield Division.

White pine, 2 year,	14,300	
White pine, 1 year,	18,590	
Scotch pine, 2 year,	8,000	
Red pine, 2 year,	25,800	
Norway spruce, 2 year,	46,300	
Norway spruce, 1 year,	78,400	
Douglas fir, 2 year,	12,000	
European larch, 1 year,	34,600	237,990

Charles R. Meek, Seven Mountain Forest, Coburn Division.

Red pine, 1-1 year,	200	
Norway spruce, 1-1 year,	400	
Douglas fir, 1-1 year,	200	800

W. E. Montgomery, Seven Mountain Forest,
Poe Division.

White pine, 2 year,	1,500	
Scotch pine, 2 year,	4,800	
Red pine, 2 year,	3,300	
Norway spruce, 2 year,	12,000	
Douglas fir, 2 year,	3,400	
European larch, 1 year,	6,000	31,000

George S. Perry, Sinnemahoning Forest, Hull
Division.

White pine, 2 year,	6,500	
White pine, 1 year,	9,418	
Scotch pine, 2 year,	2,100	
Scotch pine, 1 year,	1,304	
Norway spruce, 1 year,	11,952	
Douglas fir, 2 year,	1,050	
European larch, 1 year,	9,787	42,111

J. B. Ryon, Whetham Forest.

White pine, 2 year,	9,200	
Scotch pine, 2 year,	8,700	
Norway spruce, 2 year,	30,000	
Douglas fir, 2 year,	4,200	52,100

Geo. W. Sheeler, Hopkins Forest, Snow Shoe
Division.

White pine, 1 year,	250	
Norway spruce, 1 year,	7,000	
European larch, 1 year,	6,500	13,750

E. H. Smith, Bald Eagle Forest.

White pine, 1-1 year,	1,000	
White pine, 2 year,	7,500	
Scotch pine, 2 year,	6,000	
Norway spruce, 1-1 year,	1,000	
Douglas fir, 2 year,	3,500	
Black walnut, 2 year,	10	19,010

John L. Strobeck, Minisink Forest, Pocono Division.

White pine, 2-1 year,	3,000	
White pine, 1-1 year,	8,654	
White pine, 2 year,	14,300	
Scotch pine, 3 year,	13,500	
Norway spruce, 2-1 year,	4,675	
Norway spruce, 3 year,	11,000	
Norway spruce, 1-1 year,	4,260	
Douglas fir, 2 year,	2,400	
Black walnut, 2 year,	33	
Black walnut, 1 year,	40	61,862
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R. B. Winter, White Deer Forest, McCall Division.

Norway spruce, 1 year,	8,000	
Douglas fir, 2 year,	400	
European larch, 1 year,	400	8,800
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Charles E. Zerby, Sinnemahoning Forest, Medix Division.

Norway spruce, 1 year,	30,200	
European larch 1 year,	14,000	44,200
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Total,		1,591,503

A summary of the stock found in these nurseries, is as follows:

1913.

Species.	Number.
White pine,	468,052
Norway spruce,	733,587
Douglas fir,	37,190
European larch,	171,287
Red pine,	111,300
Scotch pine,	64,154
White ash,	5,600
Black walnut,	333
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Total,	1,591,503

STATE FOREST PLANTING, 1912.

A detailed statement showing the location, the species, and the number of trees planted within the State forests during the above year, is as follows. The trees were forwarded from the three principal State forest nurseries to the foresters, who planted them in open places within their forests.

Seedling Trees from the Mont Alto Nursery.

A. W. Bodine, Rothrock Forest.

Species.	Age.	Number.
Norway spruce,	2 years, ..	6,000
Willow cuttings,		5,000

H. E. Bryner, Pennypacker Forest.

Red oak,	1 year, ...	10,000
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W. L. Byers, Bedford Forest.

White pine,	2 years, ..	20,000
Red oak,	1 year, ...	3,700

Wm. F. Dague, Clearfield Forest, Clearfield Division.

White pine,	2 years, ..	10,000
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R. Lynn Emerick, Kettle Creek Forest, Crossfork Division.

Norway spruce,	2 years, ..	12,000
Red oak,	1 year, ...	40,000

P. Hartman Fox, Sinnemahoning Forest, Austin Division.

White pine,	2 year, ...	9,200
White pine,	1-2 year, ...	3,350
Norway spruce,	2 years, ..	900
Red oak,	1 year, ...	10,000

John W. Keller, Black Forest, Blackwells Division.

Norway spruce,	2 years, ..	2,000
Red oak,	1 year, ...	6,000

Carl L. Kirk, Clearfield Forest, Penfield Division.

White pine,	2 years, ..	16,000
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Walter D. Ludwig, Seven Mountain Forest, Bear Meadows Division.

Red oak,	1 year, ...	20,000
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C. C. Miner, Stone Forest, Chatham Division.

Species.	Age.	Number.
Red oak,	1 year, ...	20,000
Willow cuttings,		4,000

Walter M. Mumma, Young Woman's Creek Forest.

White pine,	2 years, ..	15,000
Norway spruce,	2 years, ..	10,000

A. E. Rupp, Buchanan Forest.

Norway spruce,	2 years, ..	3,000
Red oak,	1 year, ...	2,500

John W. Seltzer, Seven Mountain Forest, Coburn Division.

Red oak,	1 year, ...	10,000
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Lewis E. Staley, South Mountain Forest, Mont Alto Division.

White pine,	2 years, ..	20,225
White pine,	1-2 year, ...	20,450
Red oak,	1 year, ...	2,000

H. Lawrence Vail, Sinnemahoning Forest, Hull Division.

Red oak,	1 year, ...	3,000
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D. Kerr Warfield, Seven Mountain Forest, Kishacoquillas Division.

White pine,	2 year, ...	8,000
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Arthur B. Wells, Grays Run Forest.

Norway spruce,	2 year, ...	12,000
Red oak,	1 year, ...	18,900
Willow cuttings,		12,000

John R. Williams, Stuart Forest.

Norway spruce,	2 years, ..	8,000
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Raymond B. Winter, White Deer Forest, McCall Division.

Red oak,	1 year, ...	4,500
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John L. Witherow, McClure Forest.

White pine,	2 years, ..	25,000
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Seedling Trees From the Asaph Nursery.

John A. Bastian, Loyalsock Forest.

White pine,	3 years, ..	7,800
Black cherry,	1 year, ...	1,300
American elm,	2 years, ..	3,000

William F. Dague, Clearfield Forest, Clearfield Division.

Species.	Age.	Number.
White pine,	3 years, ..	40,000

Harry E. Elliott, Sinnemahoning Forest.

White pine,	2-1 year, ...	15,000
Norway spruce,	2-1 year, ...	12,900

R. Lynn Emerick, Kettle Creek Forest, Crossfork Division.

White pine,	3 years, ..	168,400
White pine,	2-1 year, ...	10,300
Norway spruce,	2 years, ..	8,000

H. C. Evans, Black Forest, Waterville Division.

White pine,	2-1 year, ...	19,000
Norway spruce,	3 years, ..	15,000
American elm,	2 years, ..	3,800
Honey locust,	1 year, ...	1,650

P. Hartman Fox, Sinnemahoning Forest, Austin Division.

White pine,	3 years, ..	60,000
White pine,	2-1 year, ...	40,000

F. D. Jerald, Black Forest, Slate Run Division.

White pine,	2-1 year, ...	15,000
Norway spruce,	2 year, ...	5,000
Honey locust,	1 year, ...	1,000
Red oak,	1 year, ...	20,000

John W. Keller, Black Forest, Blackwells Division.

White pine,	2-1 year, ...	60,000
Scotch pine,	2 years, ..	2,000
European larch,	2 years, ..	4,350
Norway spruce,	2-1 year, ...	1,350
Norway spruce,	3 years, ..	9,300

Carl L. Kirk, Clearfield Forest, Penfield Division.

White pine,	3 years, ..	100,000
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Walter D. Ludwig, Seven Mountain Forest, Bear Meadows Division.

White pine,	3 years, ..	30,000
Scotch pine,	2 years, ..	9,900
Scotch pine,	3 years, ..	300
Scotch pine,	2-1 year, ...	1,200

John L. MacAvoy, Kettle Creek Forest, Leidy Division.

White pine,	3 years, ..	8,000
Norway spruce,	2 years, ...	2,000

Homer S. Metzger, White Deer Forest, Tea Spring Division.

Species.	Age.	Number.
American elm,	2 years, ..	5,000

C. C. Miner, Stone Forest, Chatham Division.

White pine,	2 years, ..	101,700
Scotch pine,	2 years, ..	1,600
Norway spruce,	2 years, ..	10,000

Paul H. Mulford, Stone Forest, Asaph Division.

White pine,	3 years, ..	32,200
White pine,	2-1 years, ..	18,500
European larch,	2 years, ..	5,875
Norway spruce,	3 years, ..	6,200
Norway spruce,	4 years, ..	270
White ash,	2 years, ..	2,347
White ash,	3 years, ..	127
Black cherry,	1 year, ...	107
American elm,	2 years, ..	7,150
Honey locust,	1 year, ...	750
Sugar maple,	2 years, ..	470
Red oak,	1 year, ...	650
White oak,	2 years, ..	250

John W. Seltzer, Seven Mountain Forest, Coburn Division.

White pine,	3 years, ..	60,000
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H. Lawrence Vail, Sinnemahoning Forest, Hull Division.

White pine,	2-1 year, ...	12,000
European larch,	2 years, ..	900
European larch,	3 years, ..	1,900
American elm,	2 years, ..	2,400
Sugar maple,	2 years, ..	850

Seedling trees from the Greenwood Nursery.

A. W. Bodine, Rothrock Forest.

Scotch pine,	2 years, ..	6,500
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W. L. Byers, Bedford Forest.

Pinus ponderosa,	2 years, ..	2,000
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F. H. Dutlinger, Hopkins Forest, Renovo Division.

Species.	Age.	Number.
Pinus ponderosa,	2 years, ..	2,000

Harry E. Elliott, Sinnemahoning Forest.

Pinus ponderosa,	2 years, ..	2,000
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R. Lynn Emerick, Kettle Creek Forest, Crossfork Division.

Pinus ponderosa,	2 years, ..	2,000
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H. C. Evans, Black Forest, Waterville Division.

Pinus ponderosa,	2 years, ..	2,000
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John W. Keller, Black Forest, Blackwells Division.

Pinus ponderosa,	2 years, ..	2,000
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Carl L. Kirk, Clearfield Forest, Penfield Division.

Scotch pine,	2 years, ..	25,000
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Walter D. Ludwig, Seven Mountain Forest, Bear Meadows Division.

White pine,	2 years, ..	124,000
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T. Roy Morton, Seven Mountain Forest, Barree Division.

Scotch pine,	2 years, ..	6,200
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George A. Retan, Seven Mountain Forest, Greenwood Division.

White pine,	2 years, ..	23,300
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Scotch pine,	2 years, ..	200
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Pinus ponderosa,	2 years, ..	1,600
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White ash,	2 years, ..	736
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Western catalpa,	1 year, ...	824
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Red oak,	1 year, ...	786
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D. Kerr Warfield, Seven Mountain Forest, Kishacoquillas Division.

White pine,	2 years, ..	35,000
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John R. Williams, Stuart Forest.

Pinus ponderosa,	2 years, ..	2,000
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Seedling trees from the Caledonia Experimental Nursery.

H. E. Bryner, Pennypacker Forest.

White pine,	1-3 years, ..	200
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Robert G. Conklin, South Mountain Forest, Caledonia Division.

White pine,	1-2 years, ..	6,625
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In addition to the above seedlings, plantings were made by the foresters from their own experimental nurseries, and the detailed records of the trees derived from such sources will be found in the reports of the foresters.

The following seedlings were planted in 1912 but were shipped to the foresters from State nurseries in the fall of 1911. Owing to late shipments and early freezing of the ground they could not be planted so were heeled in over winter:

H. E. Bryner, Pennypacker Forest.

Species.	Age.	Number.
White ash, .....1	year, ...	5,600
Red oak, .....1	year, ...	19,000

A. E. Rupp, Buchanan Forest.

Red oak, .....1	year, ...	1,000
Catalpa, .....2	years, ..	105
White ash, .....2	years, ..	1,300
Elm, .....2	years, ..	100
Willow cuttings,		2,000

C. C. Miner, Stone Forest, Chatham Division.

White ash, .....1	year, ...	9,000
Honey locust, .....1	year, ...	500

John E. Avery, Minisink Forest, Notch Division.

Elm,1	year, ...	200
Red oak, .....1	year, ...	900
Total seedlings,		37,705
“ cuttings,		2,000

In 1912, 100,000 2 year-old Scotch pine were purchased from the North Eastern Forestry Co., Cheshire, Conn., and 200,000 3 year-old white pine from the Mt. Carmel Forestry & Nursery Co., Hartford, Conn. These seedlings were planted by the following foresters:

R. Lynn Emerick, Kettle Creek Forest, Crossfork Division.

Scotch pine,	20,000
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F. H. Dutlinger, Hopkins Forest, Renovo Division.

Scotch pine,	20,000
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Walter M. Mumma, Young Woman's Creek Forest.

Scotch pine,	10,000
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Carl L. Kirk, Clearfield Forest, Penfield Division.		
Scotch pine,	32,000	
C. C. Miner, Stone Forest, Chatham Division.		
Scotch pine,	8,000	
John W. Seltzer, Seven Mountain Forest, Coburn Division.		
Scotch pine,	10,000	
John E. Avery, Minisink Forest, Notch Division.		
White pine,	15,000	
A. W. Bodine, Rothrock Forest.		
White pine,	50,000	
F. H. Dutlinger, Hopkins Forest, Renovo Division.		
White pine,	50,000	
Walter D. Ludwig, Seven Mountain Forest, Bear Meadows Division.		
White pine,	50,000	
A. C. Silvius, White Deer Forest, Buffalo Division.		
White pine,	30,000	
John L. Strobeck, Minisink Forest, Pocono Division.		
White pine,	5,000	
Total planting for 1912 from the Mont Alto Nursery,		
all species, Seedlings,	351,725	
Cuttings,	21,000	
Total plantings for 1912 from the Asaph Nursery, all		
species, Seedlings,	946,796	
Total plantings for 1912 from the Greenwood Nursery,		
all species, Seedlings,	238,146	
Total plantings for 1912 from the Caledonia Experi-		
mental nursery, Seedlings,	6,825	
Total plantings for 1912 from the experimental nurseries		
of the foresters, Seedlings,	6,232	
Cuttings,	5,000	
Mt. Carmel Forestry & Nursery Co., Seedlings,		
	200,000	
North Eastern Forestry Co., Seedlings,		
	100,000	
Nursery shipments for 1911 (heeled in over the winter		
by foresters), Seedlings,	37,705	
Cuttings,	2,000	
Total of all State forest planting, 1912,		
	1,915,429	

Total plantings for 1912 by species:

White pine,	1,337,697
Scotch pine,	153,020
Pinus ponderosa,	15,600
European larch,	13,025
Norway spruce,	125,090
White ash,	19,110
Black cherry,	1,407
Catalpa,	1,029
Elm,	21,650
Honey locust,	3,900
Sugar maple,	1,320
Red oak,	193,136
White oak,	250
Black walnut,	1,195
Willow cuttings,	28,000

Total State forest planting during 1912, 1,915,429

STATE FOREST PLANTING, 1913.

Seedlings from the Mont Alto Nursery.

A. W. Bodine, Rothrock Forest.

Species.	Age.	Number.
White pine, .....2	years, ..	81,500
Norway spruce, .....2	years, ..	15,000
White ash, .....1	year, ...	1,000
Black cherry, .....1	year, ...	2,000
Honey locust, .....1	year, ...	1,150
Black walnut,1	year, ...	1,000

H. E. Bryner, Pennypacker Forest.

Willow cuttings,	4,500
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N. R. McNaughton, Clearfield Forest, Karthaus Division.

Privet,1	year, ...	200
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Walter M. Mumma, Young Woman's Creek Forest.

Species.	Age.	Number.
White pine,	1-2 year, ...	13,400
Norway spruce,	2 years, ..	8,600

M. O. Robinson, Minisink Forest, Promised Land Division.

Willow cuttings,		300
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A. E. Rupp, Buchanan Forest.

Norway spruce,	2 years, ..	15,000
White ash,	1 year, ...	4,000

John W. Keller, Black Forest, Blackwell Division.

(Fall planting.)

White pine,	2 years, ..	1,000
Norway spruce,	2 years, ..	1,000
European larch,	2 years, ..	1,000

J. B. Ryon, Whetham Forest.

Pinus ponderosa,	2 years, ..	1,000
Scotch pine,	2 years, ..	2,100
Norway spruce,	2 years, ..	7,100
Black cherry,	1 year, ...	900

Lewis E. Staley, South Mountain Forest, Mont Alto Division.

White pine,	2 years, ..	50,900
White ash,	1 year, ...	3,000
Black cherry,	1 year, ...	3,500
Red oak,	1 year, ...	490
White oak,	1 year, ...	1,440
Black walnut,	1 year, ...	5,800

Seedlings from the Asaph Nursery.

John E. Avery, Minisink Forest, Notch Division.

White pine,	2-1 year, ...	5,000
Balsam fir,	5 years, ..	10

H. E. Bryner, Pennypacker Forest.

White pine,	3 years, ..	50,000
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W. G. Conklin, Seven Mountain Forest, Jacks Mountain Division.

Species.	Age.	Number.
White pine,	5 years, ..	25
Red pine,	2 years, ..	25

William F. Dague, Clearfield Forest, Clearfield Division.

White pine,	2 years, ..	115,000
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F. H. Dutlinger, Hopkins Forest, Renovo Division.

White pine,	2-1 year, ...	62,000
Silver pine,	3 years, ..	5,000
Norway spruce,	3 years, ..	11,500

Harry E. Elliott, Sinnemahoning Forest.

White pine,	3 years, ..	25,000
Norway spruce,	3 years, ..	25,000

R. Lynn Emerick, Kettle Creek Forest, Crossfork Division.

White pine,	3 years, ..	254,800
Silver pine,	3 years, ..	2,000
Norway spruce,	2 years, ..	82,500

H. C. Evans, Black Forest, Waterville Division.

White pine,	3 years, ..	45,000
White pine,	5 years, ..	50
Scotch pine,	2-1 year, ...	20
Black cherry,	3 years, ..	5
Honey locust,	1 year, ...	5
Black walnut,	1 year, ...	10
American elm,	2 years, ..	10

P. Hartman Fox, Sinnemahoning Forest, Austin Division.

White pine,	3 years, ..	100,000
Scotch pine,	2 years, ..	22,800
Silver pine,	3 years, ..	5,000
Norway spruce,	2 years, ..	28,500

J. R. Hogentogler, McElhattan Forest.

White pine,	3 years, ..	85,000
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James A. Irvin, Sinnemahoning Forest, Medix Division.

White pine,	2-1 year, ...	47,200
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John W. Keller, Black Forest, Blackwells Division.

White pine,	2 years, ..	139,700
White pine,	3 years, ..	8,790
Silver pine,	3 years, ..	5,000
Norway spruce,	2 years, ..	36,800
Norway spruce,	3 years, ..	13,491
Red pine,	2 years, ..	21,780

Carl L. Kirk, Clearfield Forest, Penfield Division.

Species.	Age.	Number.
White pine,	2 years, ..	27,000
White pine,	3 years, ..	22,000
White pine,	2-1 year, ...	39,500
Silver pine,	3 years, ..	2,500
Norway spruce,	2 years, ..	16,000
Norway spruce,	3 years, ..	10,800
Red pine,	2 years, ..	10,000

John L. MacAvoy, Stuart Forest.

White pine,	3 years, ..	50,000
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William S. McCoy, Leidy, Forest Ranger, Kettle Creek Forest.

White pine,	3 years, ..	100,000
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N. R. McNaughton, Clearfield Forest, Karthaus Division.

White pine,	2-1 year, ...	310,100
Silver pine,	3 years, ..	1,000
European larch,	2 years, ..	5,000
Norway spruce,	2 years, ..	5,000

Homer S. Metzger, White Deer Forest, Tea Spring Division.

White pine,	2-1 year, ...	5,000
Scotch pine,	2 years, ..	2,000
Norway spruce,	2-1 year, ...	2,000

C. C. Miner, Stone Forest, Chatham Division.

White pine,	2 years, ..	126,500
Silver pine,	3 years, ..	5,000
European larch,	2 years, ..	3,939
Norway spruce,	2 years, ..	7,300

T. Roy Morton, Seven Mountain Forest, Barree Division.

White pine,	1-2 year, ..	300
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Paul H. Mulford, Stone Forest, Asaph Division.

White pine,	2 years, ..	22,000
Scotch pine,	2 years, ..	4,100
Silver pine,	3 years, ..	3,188
Norway spruce,	2 years, ..	21,800

Walter M. Mumma, Young Woman's Creek Forest.

Red pine,	2 years, ..	10,000
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M. O. Robinson, Minisink Forest, Promised Land Division.

White pine,	2-1 year, ...	10,000
White ash,	1 year, ...	9,175

A. E. Rupp, Buchanan Forest.

Species.	Age.	Number.
White pine,	3 years, ..	10,000

J. B. Ryon, Whetham Forest.

Sugar maple,	2 years, ..	4,622
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A. C. Silvius, White Deer Forest, Buffalo Division.

White pine,	2-1 year, ..	34,400
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E. H. Smith, Bald Eagle Forest.

White pine,	2-1 year, ..	10,000
Norway spruce,	2-1 year, ..	10,000
Black walnut,	1 year, ..	210

John L. Strobeck Minisink Forest, Pocono Division.

Balsam fir,	5 years, ..	12
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H. A. Thomson, Black Forest.

White pine,	3 years, ..	20,100
Pitch pine,	2 years, ..	8,716
Red pine,	2 years, ..	1,000

H. Lawrence Vail, Sinnemahoning Forest, Hull Division.

White pine,	2 years, ..	11,500
White pine,	3 years, ..	60,000
Silver pine,	3 years, ..	5,000

A. B. Wells, Grays Run Forest.

White pine,	3 years, ..	10,000
White pine,	2-1 year, ...	8,000
Norway spruce,	2 years, ..	1,500
Norway spruce,	2-1 year, ...	10,000

John R. Williams, South Mountain Forest, Pine Grove Division.

White pine,	3 years, ..	50,000
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R. B. Winter, White Deer Forest, McCall Division.

White pine,	2-1 year, ...	1,000
Norway spruce,	2-1 year, ...	1,000

Seedlings from the Greenwood Nursery.

Tom O. Bietsch, Seven Mountain Forest, Greenwood Division.

White pine,	2 years, ..	47,000
Scotch pine,	2 years, ..	11,800
Red pine,	2 years, ..	17,000

A. W. Bodine, Rothrock Forest.

Species.	Age.	Number.
White pine,	2 years, ..	36,400

W. L. Byers, Bedford Forest.

White pine,	3 years, ..	20,000
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W. B. Evans, Sinnemahoning Forest, Sizerville Division.

White pine,	2 years, ..	80,000
Scotch pine,	2 years, ..	20,000
Red pine,	2 years, ..	2,000

W. Elmer Hought, Trough Creek Forest.

White pine,	3 years, ..	15,000
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Walter D. Ludwig, Seven Mountain Forest, Bear Meadows Division.

White pine,	2 years, ..	80,000
White pine,	3 years, ..	23,000
Scotch pine,	2 years, ..	1,000

Charles R. Meek, Seven Mountain Forest, Coburn Division.

White pine,	2 years, ..	100,000
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Charles R. Meek, Seven Mountain Forest, Poe Division.

White pine,	2 years, ..	25,000
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J. B. Ryon, Whetham Forest.

White pine,	2 years, ..	20,400
Scotch pine,	2 years, ..	4,000

George W. Sheeler, Hopkins Forest, Snow Shoe Division.

White pine,	3 years, ..	5,000
Scotch pine,	2 years, ..	5,000

E. H. Smith, Bald Eagle Forest.

White pine,	3 years, ..	20,000
Scotch pine,	2 years, ..	9,000

D. Kerr Warfield, Seven Mountain Forest, Kishacoquillas Division.

White pine,	2 years, ..	29,500
Red pine,	2 years, ..	2,000

Seedlings from the Caledonia Nursery.

N. R. McNaughton, Clearfield Forest, Karthaus Division.

White pine,	1-2 year, ...	17,000
Norway spruce,	1-2 year, ...	8,000

Robert G. Conklin, South Mountain Forest, Caledonia Division.

Species.	Age.	Number.
White pine,	1-1 yr.,	6,800
White pine,	1-3 yr.,	1,380
Norway spruce,	1-1 yr.,	9,050
Norway spruce,	1-2 yr.,	700
Scotch pine,	1-1 yr.,	800
Scotch pine,	1-2 yr.,	5,750
Total seedling trees from the Mont Alto Nursery, planted during 1913,		221,880
Total seedling trees from the Asaph Nursery planted during 1913,		2,285,283
Total seedling trees from the Greenwood Nursery planted during 1913,		573,100
Total seedling trees from the Caledonia Nursery planted during 1913,		49,480
Total cuttings from the Mont Alto Nursery,		5,000
Total seedling trees from the experimental nurseries of foresters planted during 1913,		37,260
Total cuttings from experimental nurseries of fore- sters planted during 1913,		3,500
Total State Forest planting, 1913,		3,175,503

Plantings during 1913 by species:

White pine,	2,540,245
Scotch pine,	91,070
Pitch pine,	9,116
Red pine,	63,805
Silver pine,	33,688
Pinus ponderosa,	1,000
European larch,	10,939
Norway spruce,	375,841
Balsam fir,	22
White ash,	17,175
Black cherry,	6,405
American elm,	10
Honey locust,	1,155
Sugar maple,	4,622
Red oak,	490

White oak,	1,440
Black walnut,	9,980
Willow cuttings,	8,300
Privet,	200

Total, 3,175,503

A statement of the State Forest planting by years to date:

Year.	Current Number	Total to Date.
1902,	5,000	5,000
1903,	1,600	6,600
1904,	5,500	12,100
1905,	40,000	52,100
1906,	112,550	164,650
1907,	36,930	201,580
1908,	88,098	289,678
1909,	750,318	1,039,996
1910,	1,110,018	2,150,014
1911,	1,771,454	3,921,468
1912,	1,915,429	5,836,897
1913,	3,175,503	9,012,400

PRIVATE PLANTING OF SEEDLING TREES SUPPLIED BY THE DEPARTMENT OF FORESTRY.

Under authority conferred by act of 22d April, 1909, P. L. 115, the Department supplies to individuals for forestry and woodlot planting such seedling trees as it is able to spare after its own necessities are provided for. These are sold at cost of production and the amount of money thus realized is paid into the State Treasury. During the year 1912, individual applications were received and seedlings forwarded as follows:

From the Mont Alto Nursery.

Ralph E. Brock, West Chester.

Species.	Age.	Number.
Red oak,	1 yr.,	10,000

H. A. Coryell, Sunbury.

White pine,	1-2 yr.,	5,000
Norway spruce,	2 yr.,	5,000

L. K. Stubbs, West Chester.

Species.	Age.	Number.
Red oak,	1 yr.,	2,000

H. B. Rowland, Sanatoga.

Red oak,	1 yr.,	4,000
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J. A. Singmaster, Gettysburg,

Red oak,	1 yr.,	7,000
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Charles S. Vail, New Milford.

White pine,	1-2 yr.,	1,000
Red oak,	1 yr.,	1,000

Total seedlings from the Mont Alto Nursery, 35,000

From the Asaph Nursery.

W. T. Creasy, Catawissa.

White pine,	2-1 yr.,	100
Norway spruce,	2-1 yr.,	100
Scotch pine,	2-1 yr.,	100

D. W. Dietrich, Reading.

Honey locust,	1 yr.,	2,000
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Dr. H. S. Drinker, South Bethlehem.

White pine,	2-1 yr.,	10,000
Norway spruce,	2-1 yr.,	5,000

Elmer E. Ehrgood, Pottstown.

Scotch pine,	2-1 yr.,	200
European larch,	2 yr.,	200
White ash,	2 yr.,	200
Sugar maple,	2 yr.,	200

Frank McFarlane, Oak Hall.

Norway spruce,	2-1 yr.,	2,000
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Kenneth Reid, Connellsville.

White pine,	2-1 yr.,	5,000
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Leonard Rhone, Centre Hall.

White pine,	3 yr.,	1,000
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H. B. Rowland, Sanatoga.

Species.	Age.	Number.
White pine,	2-1 yr.,	3,000
A. E. Strode, Camp Hill.		
White ash,	4 yr.,	4
Total seedlings from the Asaph Nursery,		29,104

Seedlings from the Greenwood Nursery.

American Bridge Co., Pencoyd.

White ash,	2 yr.,	1,000
Red oak,	1 yr.,	1,000
Total seedlings from the Greenwood Nursery,		2,000

Seedlings from the Caledonia Nursery.

Dr. H. M. Carey, Spring City.

White pine,	1-3 yr.,	500
A. E. Thomas, Supt., Mt. Gretna.		
White pine,	1-3 yr.,	250
Total seedlings from the Caledonia Nursery,		750

Total seedlings for private forest planting during 1912.

Mont Alto Nursery,	35,000
Asaph Nursery,	29,104
Greenwood Nursery,	2,000
Caledonia Nursery,	750
Total,	66,854

SEEDLINGS FURNISHED FOR PRIVATE PLANTING, 1913.

From the Mont Alto Nursery.

Hon. Robert S. Conklin, Columbia.

Privet cuttings,	700
C. J. Middleswarth, Troxelville.	
Privet cuttings,	175

Philadelphia Forestry Exhibit.

Species.	Age.	Number.
Black cherry,	1 yr.,	100
Pittsburgh Forestry Exhibit.		
White pine,	1 yr.,	250
White pine,	2 yr.,	50
European larch,	1 yr.,	50
Norway spruce,	1 yr.,	250
Norway spruce,	2 yr.,	50
White oak,	1 yr.,	50
Red oak,	2 yr.,	50
Black walnut,	1 yr.,	50
Sycamore,	2 yr.,	50
Total seedlings from the Mont Alto Nursery,		950
Cuttings,		875

From the Asaph Nursery.

M. L. Benn, Coudersport.

Scotch pine,	2 yr.,	12
European larch,	2 yr.,	5
Norway spruce,	2-1 yr.,	250
White ash,	1 yr.,	12

Charles E. Brey, Red Hill.

White pine,	2-1 yr.,	1,500
Norway spruce,	2-1 yr.,	1,000
White ash,	1 yr.,	1,000
Honey locust,	1 yr.,	750
Sugar maple,	2 yr.,	500

Harry S. Calvert, Sharpsburg,

White pine,	5 yr.,	25
Norway spruce,	2-1 yr.,	25
Pitch pine,	2 yr.,	25
Balsam fir,	5 yr.,	10
White ash,	1 yr.,	25
Red oak,	2 yr.,	25

Elmer E. Ehrgood, Pottstown.

White pine,	2-1 yr.,	200
Scotch pine,	2 yr.,	200
European larch,	2 yr.,	200
White ash,	1 yr.,	400

Species.	Age.	Number.
Honey locust,	1 yr.,	200
Sugar maple,	2 yr.,	200
Black walnut,	1 yr.,	200
Mrs. C. M. Fisher, Irwin.		
Sugar maple,	2 yr.,	1,000
R. H. Ferguson, Oxford.		
White pine,	2-1 yr.,	1,000
Honey locust,	1 yr.,	750
Black walnut,	1 yr.,	100
Albert Karhan, Sabinsville.		
White pine,	2-1 yr.,	2,000
Norway spruce,	2-1 yr.,	2,000
Lehigh University, South Bethlehem.		
White pine,	2-1 yr.,	5,000
Norway spruce,	2-1 yr.,	5,000
Red pine,	2 yr.,	5,000
Pittsburgh Forestry Exhibit.		
Sugar maple,	2 yr.,	50
American elm,	2 yr.,	50
Philadelphia Forestry Exhibit.		
White pine,	2 yr.,	300
White pine,	3 yr.,	200
European larch,	2 yr.,	300
Norway spruce,	2 yr.,	300
Norway spruce,	3 yr.,	200
Pitch pine,	2 yr.,	300
Red pine,	2 yr.,	300
White ash,	1 yr.,	100
Honey locust,	1 yr.,	100
Black walnut,	1 yr.,	90
J. L. Rockey, Mt. Gretna.		
White pine,	2-1 yr.,	500
Norway spruce,	2-1 yr.,	500
J. A. Seguire, Cresco.		
White pine,	2-1 yr.,	500
Norway spruce,	2-1 yr.,	1,000
Honey locust,	1 yr.,	1,000
Black walnut,	1 yr.,	100

G. A. Stebbins, Sabinsville.

Species.	Age.	Number.
White pine,	1-2 yr.,	100

A. E. Strode, Camp Hill.

White ash,	3 yr.,	4
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W. W. Thompson, Coudersport.

White ash,	1 yr.,	500
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Total seedlings from the Asaph Nursery,	35,108
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From the Caledonia Nursery.

Dr. H. M. Carey, Spring City.

White pine,	1-2 yr.,	3,000
Scotch pine,	1-1 yr.,	100
European larch,	1-1 yr.,	375
Norway spruce,	1-2 yr.,	500
White ash,	1 yr.,	500

H. K. Deisher, Kutztown.

White pine,	1-3 yr.,	200
Scotch pine,	1-1 yr.,	100
Norway spruce,	1-2 yr.,	100
White ash,	1 yr.,	200

Cyrus G. Derr, Reading.

White pine,	1-2 yr.,	3,000
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W. H. Ennis, Harrisburg.

White pine,	2-3 yr.,	2
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C. R. Pendleton, Bryn Athyn.

Norway spruce,	1-2 yr.,	500
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Philadelphia Forestry Exhibit.

White pine,	1-2 yr.,	60
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Hon. Leonard Rhone, Centre Hall.

White pine,	1-3 yr.,	1,000
Norway spruce,	1-2 yr.,	1,000

I. C. Williams, Royersford.

White pine,	2-3 yr.,	50
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Samuel S. Wylie, Shippensburg.

White pine,	1-3 yr.,	25
Scotch pine,	1-1 yr.,	25
Norway spruce,	1-2 yr.,	25
White ash,	1 yr.,	25

Total seedlings from the Caledonia Nursery, 10,790

From the Metal Nursery.

Philadelphia Forestry Exhibit.

Norway spruce,	2-2 yr.,	50
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Total seedlings furnished during 1913 for individual
 use, 46,898
 Cuttings, 875

For certain of the above seedlings, being for public purposes, the Department made no charge; likewise also certain others which were sent out for experimental purposes. These include the shipment to Dr. Carey at Spring City for planting upon the grounds of the State Institution for Feeble-Minded, those to Mr. Williams for experimental planting in dry shale, and those to the Pittsburgh and Philadelphia Forestry Exhibits.

PENNSYLVANIA FOREST TOPOGRAPHIC AND STOCK SURVEY AND NURSERY INVESTIGATION.

In July, 1913, at the request of the Commissioner of Forestry, Forester W. Gardiner Conklin submitted a plan for a proposed topographic and stock survey of the State Forests, to be coupled with a general investigation of the subject of local seed collection, seed germination, and the growing of seedling trees in State Forest nurseries. Prior to this time, in the early part of the year, Forester Conklin was directed to report to the Department for such general service preparatory to taking up this work as might be necessary and useful. He submits his report on these preliminary activities, which will be found in its proper place under report of the forester in charge of Jacks Mountain Division, Seven Mountain Forest, page 365.

The progress of the topographic work and the stock survey is shown by his report which follows:

TOPOGRAPHIC AND STOCK SURVEY, 1913.

W. Gardiner Conklin, Forester.

Early in the year of 1913 the proposition was advanced to have Topographic Surveys made of the State Forests, and at the same time take notes on growth and soil conditions from which the many types of forest and other productive and unproductive lands belonging to the Commonwealth might be made available. In other words, this effort is intended to be an inventory by acreage of the various types of land under the control of the Department of Forestry.

On July 28th, I submitted a "Proposal for Topographic and Stock Surveys of Pennsylvania State Forests," the introduction to which was the following statement:

"The State of Pennsylvania, through the Department of Forestry, has been acquiring land for State Forests since 1898, and to-day owns a total of 983,529 acres, 29.24 perches, for which \$2,219,774.26 has been paid. But does the State of Pennsylvania or the Department of Forestry itself know just what it does own? What do we know about the growth in the aggregate found on this land? What is the area of stands of merchantable timber, or its approximate volume; the area of stands not in need of improvement, or the area needing improvement; the area upon which there is little or nothing of value, or the area which will never produce anything of value except by artificial means? \$2,219,774.26 has been paid for land and we cannot give even approximate estimates of its value for there are no figures available from which computations or estimates of its value can be made. There is no doubt but that the Department has received full value for the money spent in the acquisition of land, but this does not alter the fact that it should know more definitely what it is worth to-day."

I was then instructed to prepare plans for making these surveys and did so, completing them about the first of September. These plans were approved.

Following is a copy of the plans as approved. A copy is supplied to each forester before taking up the survey of his division:

It being the intention of the Department of Forestry to have Topographic and Stock Surveys made of all State Forests, each forester will be directed to assume charge of the work on his division. In order that the surveys may be made in a uniform manner, the following plans have been worked out and must be strictly adhered to. The work will at all times be under the direction of the Department.

Thus far comparatively little forestry, aside from protection, has been practiced on State Forests. This is as it should have been, for protection in pioneer forestry is the all-important factor to begin with. But the time is at hand when we must look to a more advanced practice of forestry.

Forest Management plans depend upon the character of the growth to be dealt with, nature of the soil, topography, the location of roads, trails, fire lanes, streams, springs, swamps, and all other features of the forest. To know thoroughly all of these features a survey must necessarily be made and maps thereof plotted.

Forest Protection depends largely upon topographic features and character of growth. More thorough protective plans can be laid out after surveys are made and the results shown in map form.

Silvicultural principles can better be put into operation after a survey of stock is made; for the various areas upon which the growth requires different methods of treatment, can better be planned for. This is important both from the management point of view and in order to show the Commission and the people what work is necessary to bring about the best forestal conditions.

Of great importance it is to determine the area and approximate amount of merchantable timber and of virgin stands. The area can be determined from the proposed survey, and the approximate amount of timber estimated by the forester at any future time by the sample plot method.

The following is little more than a synopsis of the method to be followed in making the survey. Owing to the varied conditions which will be encountered with this work on the different forests, more explicit directions are not practicable, for details will vary with different conditions.

As a majority of the foresters have Tracy's "Plane Surveying," this book will be used for reference. Whenever reference is made, as "Page 117, Par. 170," it refers to a page and paragraph in Tracy.

FIELD WORK.

Traverses. (Page 117, Par. 170.)

KINDS.—Traverse lines will be of two kinds and may be styled, for convenience, primary or base lines, and secondary lines. The primary or base lines will be run with the transit and should follow the principal roads, trails, or fire lanes, and connections made wherever convenient to do so; in other words, close the traverses. Deflection angles will be taken. (Page 117, Par. 168. Page 155.)

The secondary lines will be run with an open sight compass (pp. 293-297) and should consist of traverses within the transit traverses,

forming a network. These lines may follow streams, roads, trails, or fire lanes not run with the transit; the summits of mountains; or the boundaries of different kinds of growths. In cases where growth conditions within a primary traverse are similar and there are few changes in contour, secondary traverses therein may be omitted.

All traverse lines will be measured with feet as the unit of measure. Consequently before plotting in the forest boundary lines which have been measured in rods, their length will necessarily be converted from rods to feet, a table for which has been supplied each forester.

Notes of growth will be taken along all lines, whether primary or secondary, and care must be observed to take such notes in clear, concise form, remembering that areas of different growths must be carefully located later on the maps, and that others who know nothing about your region may have to plot your notes.

The number and location of transit lines will depend upon the size of the division of the forest, the topography, the location of open roads, etc., but they will usually follow the main roads or run through the main valleys. Connecting lines will be made every five or six miles, or wherever convenient. This, however, must be determined on the ground. The closing of traverses is very important as they serve as checks on both field and office work.

STARTING POINTS.—The starting point of traverses should be points of known location, as corners of the State Forest, and corners should be tied up to wherever practicable. This pertains to county and township corners as well as corners of the forest boundary.

In localities where conditions will allow, one or more complete circuits or traverses should be completed each day. That is, by evening, work back to the point of beginning in the morning. This may be possible only in running the secondary or open sight compass lines, but in some regions it may be practicable with the primary lines.

MAGNETIC DECLINATION.—(Pp. 541-542). The magnetic declination of the needle shall be set off on the transit and compass so that readings will correspond to true north and south. The declination, which may be difficult to obtain in some localities, may be calculated and be of sufficient accuracy for this work. The magnetic declination in this State is west. If a true meridian has been established anywhere in your locality, the transit and compass should be set up over this meridian line before starting the survey and the declination on the instrument corrected.

STATIONS—STAKES.—Each line of the traverses should be known by a letter of the alphabet and the stations numbered consecutively, as A¹, A², A³, etc.

It will not be necessary to mark each station by a stake, but at intervals of $\frac{1}{4}$ to $\frac{1}{2}$ mile a set of three stakes, marked with the numbers of the stations should be set at the three succeeding stations. At points from which connecting lines are to be made, whether primary or secondary, a set of three stations should be marked by stakes. Sets of three stations should also be marked by stakes carefully numbered, at points where foresters on adjoining divisions will be able to tie to. This includes both primary and secondary traverses, but more particularly the primary.

In order to save carrying stakes when making the traverses, they may be distributed at intervals along the proposed lines beforehand.

All stakes should be made of oak or some other tough wood, preferably seasoned, for keel marks will not be washed off so easily as on green wood. They should be sawed in two sizes, 2"x2"x12" long, and 1"x1 $\frac{1}{2}$ "x18" long. The 2"x2"x12" stakes will mark the station proper, and be driven nearly flush with the ground. The 1"x1 $\frac{1}{2}$ "x18" stakes will be guard stakes and be marked with the name of the line and number of the station. Blue keel will be used for primary or transit lines, and red keel for secondary lines.

CHECK.—Prominent points, as a gap or peak of a mountain, should be picked out occasionally, and the bearing to this point taken from different stations. From the intersection of these lines, practically a triangular method, when plotting the survey, the location of these points can be determined. They will also serve as a check on the survey. This is particularly true and advisable when running the secondary lines, for mistakes in reading bearings from open sight compasses are apt to occur and checks in this method of traversing are lacking.

CREW.—The crew when running the primary lines should consist of 1 transitman (the forester) who shall also keep the notes; 2 rodmen, 2 chainmen.

An axeman may be needed part of the time but usually little cutting will be necessary as the traverses will generally follow roads, and other open lines. What little cutting is needed may be done by the rodmen or chainmen.

When running secondary lines, a crew should usually consist of three men, the forester and two others, one or both of whom may be rangers. The forester will be instrument man and note keeper. The other two men will be chainmen. One will also perform the duties of rodman and the other will carry a small axe. It may frequently be necessary to provide one or two axemen when running where there are no roads or trails to follow.

ELEVATIONS.

BENCH MARKS (Differential Leveling, Page 242 and pp. 248 to 253.)—One or more accurate bench marks should be established on the division before any other work is started, a Wye level being used. The nearest bench mark in the neighborhood of the forest will usually be found along railroads, and their location and elevation may be obtained from the company.

The crew will consist of two men, a levelman (the forester) and a rodman.

PROFILE LEVELING (pp. 242 and 251).—Using the bench marks as starting points, thereafter all elevations will be obtained by the vertical angle method (page 98). When running primary lines, the vertical angle will be taken to each station from the vertical arc on the transit. Where the contour of the land is variable, elevations of points around the stations should be taken. (Intermediate stations.)

With secondary lines, elevations will be taken by the use of a Military Clinometer or Abney Level. An aneroid barometer may be substituted for the clinometer or Abney level to obtain elevations along the secondary lines. The vertical angle to prominent points, as mountain tops, to which bearings are taken from different traverse stations, should also be read and noted. The distance to these points can be measured on the map after the point is located by intersecting lines.

STOCK.

In order to locate the boundaries of different types of growth, measurements may be made from a station or stations, both from primary and secondary lines, to the edge, and the bearing and measured distance noted. Streams, springs, buildings, and camp sites may be located in the same manner. Width of streams and size of springs and buildings should be taken and noted (Page 133, Par. 194).

OUTLINE OF AREAS TO BE DETERMINED FOR STOCK INVENTORY AND NOTES TAKEN ACCORDINGLY.

- A. Areas of virgin forest and virgin timber (noting the distinction), mature or hypermature forest, and approximately the volume of material it would produce. Note species, undergrowth, soil, and humus.

- B. Areas covered with stands having a density of 50 per cent. or over, giving species, character of undergrowth, soil, and humus. This area to be divided into two classes:
1. Area not in need of improvement.
 2. Area in need of improvement. This area to be subdivided into two classes.
 - a. Area upon which thinnings or improvement cuttings should be made.
 - b. Area upon which the growth should be reinforced by planting or seed sowing.
- C. Areas with scattered trees, from a density of 10 per cent. to 50 per cent., giving species, character of undergrowth, soil, and humus. This area to be divided into two classes:
1. Area which will be reforested naturally.
 2. Area which must be artificially reforested.
- D. Areas not included in the above but covered with scrub oak, bracken, sweet fern, briars, huckleberry bushes, and weeds. This area to be divided into two classes:
1. Area which will be reforested naturally.
 2. Area which must be artificially reforested.
- E. Areas of open ground where seed or seedlings may be planted now with little or no difficulty, as old fields and mill sites.
- F. Areas recently burned and date of fire. Take notes on the damage done, character of growth now, and general conditions found.
- G. Areas covered with water; lakes, dams, ponds, streams, and springs.
- H. Areas used for roads, trails, and fire lanes.
- I. Areas under cultivation; farms.

Each forester should be well enough acquainted with growth conditions to know approximately at least the boundary of different classes of growth. For instance, he should know the extent of a certain area upon which the growth would be classed as 50 per cent. density or over, and upon which there is a scattering of merchantable timber which should be removed to give the young growth better chance.

It may frequently be possible to obtain data as to the boundaries of different kinds of growth by measuring from the forest's surveyed corners and lines, and thereby save the running of certain lines.

Particular care should be used in locating virgin tracts of timber, merchantable stands, plantations, and areas lately burned. In some instances it may be advisable to run around these areas, especially virgin timber and plantations.

INSTRUMENTS AND MATERIALS.

A *Wye Level* and a *Philadelphia Level Rod* for establishing bench marks. One bench mark on each division will usually suffice.

Randolph Mountain Transit for running primary traverses and for taking vertical angles. A level rod and range pole will be used with the transit.

A *K. and E. Open Sight Compass* will be used for the secondary traverses, and either a *Military Clinometer* or an *Abney Level* for taking vertical angles. One range pole will be necessary.

A. K. and E. 50 foot chain and 14 inch *steel arrows* (marking pins) will be used in measuring the horizontal distances.

A single lens *magnifying glass* will be used in reading angles.

Note books, blue and red keel, pencils, ink, erasers, and detail paper will be furnished as required.

Each forester is expected to have his own set of drafting instruments which should include:

- 1 protractor,
- 1 straight edge,
- 1 45° triangle,
- 1 30° x 60° triangle,
- 1 triangular scale,
- 1 ruling pen.

Each forester will be charged with the instruments and material sent him which are the property of the Department and no interchanging of instruments must take place without authority to do so. This rule is imperative.

Care of instruments (pp. 607 to 619). Read carefully and act accordingly.

NOTES.

All notes should be full and complete, the forester not trusting to memory for any detail that will be valuable when plotting. These notes should be taken while in the field and not left to be worked up in the office. He should bear in mind that others will have to use his notes. Notes on growth may require so many lines that few transit or compass station notes can be placed on one page. This simply means leaving vacant lines on the left hand page. Or, if it can be done without crowding or interfering with the transit notes, occasionally details of growth, or other items may be noted on the left hand page.

Primary Traverses.—Topographic note books will be used, the eight columns on the left hand page being arranged as follows:

Angle.	Value.	Bearing.	Corrected Bearing.	Line.	Length.	Vertical Angle.	Elevation.
A A ¹ A ² , ..	2° 7' L, ..	N 49° 20' W, ..	N 49° 17' W,	A ¹ A ²	360	2° 3' +	B. M. 968.
A ¹ A ² A ³ , ..	16° 20' L, ..	N 65° 40' W, ..	N 65° 37' W,	A ² A ³	400	3° 10' -	980.8
A ³ ,		N 60° E, ...			250	4° +	958.7
		S 20° W,			320	3° 30' -	998.3
A ² A ³ A ⁴ , ..	15° 20' L, ..	N 81° 0' W, ..	N 80° 57' W,	A ³ A ⁴	460	4° 20' -	961.2
A ³ A ⁴ A ⁵ , ..							958.7
							928.4

Secondary Traverses.—Regular field note books should be used for this, the six columns on the left hand page being arranged as follows:

Station.	Line.	Length.	Bearing.	Vertical.	Elevation.
A 16,	A 16 n 1,	325	S. 42° E,	5° 30' +	1046.
n 1,	n 1 n 2,	250	S. 50° 30' E,	4° -	1077.4
n 2,	n 1 n 3,	275	S. 60° 15' E,	2° 30' +	1068.9
n 3,					1071.9
		300	N. 20° W,	3° 30' +	1078.3
		280	N. 30° E,	2° -	1050.1
n 3,	n 3 n 4,				1071.9

The elevations of the regular stations given in the first column and indicated by the middle letter and a number in that column are on the same line in the last column. The data to obtain the elevation (vertical angle and length of the line), however, are on the first line above. In other words, the vertical angle and length of the line taken from one station are used to obtain the elevation of the following station. For example: The angle given in the first column is A A¹ A² and the station over which the instrument is set is A¹. The length of the line to station A² is 360 feet and the vertical angle to station A² is 2° 3' +. The elevation of station A¹ (968 feet) is on the same line and to get the elevation of station A² the length of the line A¹ A² (360 feet) and the vertical angle to station A² (2° 3' +) is used to get the elevation of station A², and is set down on the line of the angle A¹ A² A³ which is the line for station A².

With *intermediate* stations the vertical angle to and the elevation of the station are on the same line. The elevation of each intermediate station is calculated from the elevation of the station from which the vertical angles are taken.

When side shots to intermediate stations are taken, allow at least one line vacant, except for the calculated elevation for the next regular station. Upon returning to the regular line, bring down the elevation figure to the line of the proper station, as in Sta. x 3 of sample

page. This does not mean that the elevations will be worked out in the field, but is mentioned so that notes in the field may be properly taken.

Consult Tracy for Field Notes, pages 164-169.

Sketches of contours, roads, streams, and other features, should usually be made on the left side of the right hand page of the note book, keeping the right side for notes on growth.

Leveling for Bench Marks.—A level note book should be used for this, the columns on the left hand page being arranged as follows:

Station.	B. S.	H. I.	F. S.	Elevation.

(Page 240, Form B.).

Rules for checking level notes (page 242).

The right hand page will be used to give the location of the turning points and bench marks.

OFFICE WORK.

Calculations.—Calculations for correcting the bearings of transit traverses will be made each day and never allowed to accumulate. (Pages 378 to 383).

Calculations of elevations will also be done on the same day as the running and kept to date.

Plotting the Survey.—A rough sketch or map must be made by the forester running the survey, and each week's notes must be plotted by the end of the week. If it be found necessary to do this on Saturday no field work need be done on that day.

The final plotting of surveys will be done in the office at Harrisburg. At the end of each month or any date set by this Department, the note books used that month or period of time set by the Department and the rough sketches must be in shape to be sent to this office where they can be used in the final plotting.

All traverses will be plotted on a scale of 800 feet to the inch and contours will be made at 20-foot intervals.

Correspondence.—No correspondence relating to this work is to be incorporated into letters containing other official correspondence. Address all communications to Robert S. Conklin, Commissioner of Forestry, indicating on letter "File T. and S. S." Indicate also on lower left hand corner of the envelope containing correspondence relating to this work, the letters "T. and S. S." Neglect to do this may result in unnecessary delay in answering communications.

ACCOUNT CHARGES.

Separate account charges are to be kept with:

1. *Leveling for Bench Marks.*—(Note distance run and name of line or lines by letter).
 - a. Time, rate, and cost: Foresters,
 Rangers,
 Labor.
 - b. Extra charges: Hauling,
 Camping,
 Other charges,
 Pro-rata charges.
2. *Primary Traverses and Elevations.* (Note distance run and name of line or lines by letter).
 - a. Time, rate, and cost: Foresters,
 Rangers,
 Labor.
 - b. Extra charges: Hauling,
 Camping,
 Other charges,
 Pro-rata charges.
3. *Secondary Traverses and Elevations.* (Note distance run and name of line or lines by letter).
 - a. Time, rate, and cost: Foresters,
 Rangers,
 Labor.
 - b. Extra charges: Hauling,
 Camping,
 Other charges,
 Pro-rata charges.
4. *Stock Inventory.* (Note name of line or lines by letter). Whenever extra time is used in taking stock inventories, making sample plots, etc., this should be charged to Stock Inventories.
 - a. Time, rate, and cost: Foresters,
 Rangers,
 Labor.
 - b. Extra charges: Hauling,
 Camping,
 Other charges,
 Pro-rata charges.
5. *Pro-rata Account.* In the Pro-rata account are charged expense items against the Topographic and Stock Survey work which cannot rightfully be charged directly to any one particular operation, but which are an expense to the work as a whole. This would include cost of stakes, traveling expenses, except when incurred by going to and from work by train, expressage on instruments, etc., etc. It is a depository for such items of expense which belong to this work but which do not belong to a specific operation in connection with the work.
 When the survey of your division is completed, the amount of the Pro-rata account will be apportioned to the various other accounts, giving the Pro-rata account credit, thus balancing that account.

Each forester should be prepared at any time to submit to the Department his accounts as above outlined. They should be kept up to date and in such form as to be intelligible to others as well as to himself. The matter of itemized costs is important and should never be neglected. Always give the name of the line or lines known by a letter of the alphabet, and the length of each upon which the expenditures were made.

DIFFERENCE IN ELEVATION TABLES.

In connection with the Topographic and Stock Survey work it was found necessary to make up tables from which the difference in elevations could be quickly obtained, given the horizontal distance and the vertical angle. These tables will be used in determining the elevation of all points to which the vertical angle has been taken in both primary and secondary traverses.

Two tables have been prepared and published in separate pamphlet form. For this reason they are not reproduced herein.

PROGRESS OF THE SURVEYS MADE IN 1913.

It was decided to make a survey of the Seven Mountain Forest first. This forest includes portions of Huntingdon, Mifflin, Centre, Union, and Snyder counties, comprises an area of approximately 145,152 acres, and is divided into the following seven divisions. The approximate area of and the forester in charge of each division are also given.

SEVEN MOUNTAIN STATE FOREST.

Kishacoquillas Division, 33,800 acres, Forester D. Kerr Warfield.
Coburn Division, 15,000 acres, Forester Chas. R. Meek.
Bear Meadows Division, 21,000 acres, Forester Walter D. Ludwig.
Greenwood Division, 23,000 acres, Forester Tom O. Bietsch.
Barree Division, 18,923 acres, Forester T. Roy Morton.
Jacks Mountain Division, 19,429 acres, Forester John R. Elder.
Poe Division, 14,000 acres, Forester W. E. Montgomery.

The plan was to have Messrs. Morton, Bietsch, Warfield, Ludwig, and Meek start their surveys in the fall. They were requested to report at this office on October 2nd to discuss the method of procedure and ways and means for carrying on the work.

Morton began the field work of the survey of the Barree Division on October 6th by starting to run a line of levels through the division along the Diamond Valley road to the Bear Meadows Division line. Temporary bench marks were established about every half mile along this line of levels and the line was completed October 20th. His starting point was a Pennsylvania Railroad bench mark at Petersburg station, the elevation of which was obtained from H. H. Russell, P. R. R. Division Engineer at Altoona, Pa. Mr. Russel also very kindly established a bench mark over the railroad tunnel between Spruce Creek and Barree.

Morton started his primary traverses after completing the line of levels and continued with them until December 13th when weather conditions made such work too difficult. He has nearly completed his primary traverses, having run about 45 $\frac{3}{4}$ miles of lines. The cost of this amounted to \$247.10 or at the rate of \$5.40 per mile. His line of levels extended for a distance of 12 miles and cost \$53.80 at the rate of \$4.48 per mile. His pro-rata account amounts to \$26.43 making a total charge of \$327.33 to date against the T. & S. S. work of the Barree Division.

Meek began the survey of the Coburn Division with primary traverses on October 14th and continued until November 7th, after which he plotted the lines run. His start was made at Paddy Mountain tunnel on the Lewisburg and Tyrone Division of the Pennsylvania Railroad and a railroad bench mark on a bridge just west of the tunnel served as a starting point from which to obtain elevations.

In all Meek ran about 17 miles of traverses which cost \$124.80 or at the rate of \$7.34 per mile. His pro-rata account amounts to \$29.57 making a total charge of \$154.37 against the T & S. S. work of his division.

Morton and Meek each have the surveys of their respective divisions well under way, having made good progress for the short time they were able to work this fall. During the open hunting season for deer, November 10th to 25th inclusive, no surveying was done. They are prepared to take up the work again in the spring, as soon as weather conditions are favorable, and will push their surveys to speedy completion.

Ludwig was unable to employ men to make up a crew for transit surveying so made no start on his traverses. His work this fall was limited to the establishing of bench marks on his division and one each for Bietsch on the Greenwood division, and Montgomery on the Poe

division. Ludwig established bench marks for these foresters because he had a bench mark to start from, and neither Bietsch nor Montgomery had convenient starting points. Then, too, it required little extra work for Ludwig since the points of the other two divisions were comparatively close to the point at which he established the bench mark for his own use. His starting point was a bench mark on bridge No. 34 of the Lewisburg and Tyrone Division of the Pennsylvania Railroad. A United States Geological Survey bench mark at the intersection of the Linden Hall, Bear Meadows, and Tusseyville roads was used later to check against.

The leveling done by Ludwig extended over a distance of $12\frac{1}{2}$ miles and cost \$85.48, or at the rate of \$6.84 per mile. Of this amount Ludwig has charged \$22.23 against each Bietsch and Montgomery for the work performed by him for them. Ludwig's pro-rata account amounts to \$33.80 giving a total charge against the T. & S. S. work of \$119.28.

Warfield was unable to begin his transit survey (primary traverses) this fall but ran a line of levels from Paddy Mountain tunnel through Havice valley a distance of 8 miles to establish a bench mark as a starting point in the spring of 1914. This is the same bench mark used by Meek near Paddy Mountain tunnel. The leveling work cost \$55.05 or at the rate of \$6.88 per mile. His pro-rata account amounts to \$12.57, making a total of \$67.62 charges against the T. & S. S. work on the Kishacoquillas division.

Bietsch was unable to begin his survey this fall owing to pressure of nursery and other work. He expects to take it up in the spring of 1914 as soon as weather conditions and spring nursery work will permit.

As starting points to obtain elevations for the topographic work, bench marks in the vicinity of the several divisions were used. For the Barree division a list of bench marks and their locations was supplied by H. H. Russel, Pennsylvania Railroad Division Engineer, Altoona, Pa. J. M. Ewing, Assistant Division Engineer at Sunbury, supplied a list for use on the Jacks Mountain and Kishacoquillas divisions, and J. B. Hutchinson, Jr., Division Engineer at Williamsport, furnished a list for use with the Kishacoquillas, Poe, Coburn, and Bear Meadows divisions.

Lists of bench marks and their locations were also furnished us by the Pennsylvania Highway Department through Samuel D. Foster, Chief Engineer, Harrisburg; C. S. Lemon, Assistant Engineer, Hollidaysburg; and A. B. Gray, Assistant Engineer, Harrisburg, Pa. These bench marks were established by the highway engineers along State highways crossing the several divisions in Huntingdon, Mifflin, and Centre counties. I take this opportunity of thanking them

for their courtesies and willing assistance rendered us by the information which they supplied.

The investigation of the nursery practice, seed collection, seed germination, nursery soil characteristics, and results in nursery practice, are embraced in the following report by Forester Conklin:

NURSERIES.

1913.

The Department of Forestry now has in the service three large permanent nurseries and 18 small foresters' nurseries which produced in the aggregate 3,038,000 seedlings, transplants, and cuttings available for 1914 spring planting. This is a fairly good showing, considering the fact that 1913 was a disastrous year for seedlings. The late spring and early fall frosts caused large losses in the nursery beds. This result indicates that the foresters are making every effort toward intensive nursery management. The three large nurseries are now well established and indicate increased production with each succeeding year. The small nurseries are more or less of an experimental nature and are maintained for their value to the public as educators. Although failures are frequently reported, some of them have given very good results. The nursery inventories for December, 1913, show close to 8,000,000 seedlings, transplants, and cuttings of all ages in the 21 nurseries.

However, our seedlings still appear to cost too much when compared to costs given out by other state nurseries and to prices quoted by commercial houses. For this reason, it has long been a question with the Department whether our nurseries are a success as a financial proposition. If seedlings can be purchased from commercial nurseries for less than our cost of raising them, then on the surface, abandoning them would appear to be best. It is true that commercial nurserymen frequently offer to the Department seedlings at a cost below that at which ours are rated. For instance, in 1913, white pines, 2 years old, were offered for \$2.10 per thousand, and those from the Asaph nursery were rated at \$2.25 per thousand. This and other such instances would indicate that there is something to be corrected in our nurseries. It may be a low ratio of seedling production to seed sown, or high labor cost and excessive overhead charges, or it may be due to our method of charging nursery stock.

I will not attempt to suggest a solution to this question but will cite a number of facts which influence cost of production, and which may throw some light on the subject.

SEED. Next to labor, the greatest cost factor is that of seed and consequently this question should be given more than ordinary consideration. Practically all our seed is purchased from commercial firms outside of the State and these firms must make their profit. Then shipping charges add something to the cost. In 1912 the Department purchased 1,025 pounds of white pine seed at a total cost of \$1,262.35 or about \$1.25 per pound, and in 1913, 800 pounds at a cost of \$1,040.00 or \$1.30 per pound. In the fall of 1911, Paul H. Mulford gathered in the vicinity of Asaph 30 pounds of white pine seed at a cost, uncleaned, of 42 cents per pound, which, compared to \$1.25 for the seed purchased for 1912 sowing, means considerable of a cost item. In the fall of 1912 Tom O. Bietsch gathered in the vicinity of Greenwood 35 pounds of white pine seed at a cost of less than 50 cents per pound, which, compared to \$1.30 per pound for that purchased in 1913, also shows considerable difference.

In other words, white pine seed was purchased for 1912 sowing at a cost of about \$1.25 per pound and that for 1913 sowing at a cost of about \$1.30 per pound which might have been gathered in this State by men now in the employ of the Department or by paying inhabitants of the region where a seed year was in progress a certain sum per bushel for the full cones.

Probably we could not expect to gather all of the seed required, nor to gather large quantities at the low cost of those gathered by Mulford or Bietsch, but it is reasonable to suppose that with suitable equipment, a large part of the seed needed, especially white pine and the broad leaved species, could be gathered at a cost below that charged by commercial firms. Allowing 75 cents per pound as the cost of gathering and cleaning white pine seed, more than 25 cents above the actual cost of that gathered by Bietsch and Mulford, the saving in 1912 would have been \$512.50 and in 1913 it would have been \$440.00. In other words it would have meant a reduction of about 20 cents per thousand on the cost of our seedlings. A saving as large as this is worthy of thoughtful consideration, since it is one of the large factors affecting the cost of seedlings.

To facilitate seed gathering, particularly conifers and other small seed, certain equipment is necessary. Upon request, E. N. Jenckes of the Asaph nursery, submitted the following list of articles to make up a cone collecting outfit, suitable for a crew of five men and two boys:

- 200 ft. $\frac{3}{4}$ " hemp rope
- 300 ft. $\frac{1}{4}$ " cotton rope
- 3 sets of body belts (supports)
- 6 hand pruners
- 3 pr. 12 ft. pruners

- 3 pr. 8 ft. pruners
- 3 pr. 6 ft. pruners
- 3 pr. climbers
- 1 gal. oil can
- 1 pt. squirt can

To this might be added blankets for spreading out under the tree when removing the cones and also bags for shipping cones to the seed house.

A fully equipped seed house for curing, drying, cleaning, and storing the seed would have to be provided at a centrally located point. Mr. Bietsch in his article following offers the suggestion that empty cones could be sold for kindling. As a matter of fact, a large part, if not all, of the empty cones could be used to supply heat for drying out the green cones and thereby save purchasing other fuel. Mr. Bietsch submitted the following article relating to seed gathering.

"Owing to the excessive cost of coniferous seed, I would like to submit a few figures relative to the collecting of tree seeds in this State.

"During the early fall of 1912, there being a partial seed year for white pine in this vicinity, we collected as many cones as possible. Thirty cents per bushel were paid to the inhabitants for them. In all, 42 bushels were gathered, which were dried on racks.

"The cones were shaken at least every week until no more seeds could be loosened in this manner. They were then thrown on the floor and trampled upon, after which they were hauled away on a wagon and used for kindling. The floor of the seed room was swept as was the bed of the wagon. This last operation netted about one-fourth of the seed.

"The cost per pound of the 35 pounds of seed obtained, including ranger's time and labor for cleaning, was less than 50 cents. If the seed house were located near a town the empty cones which double in bulk when drying, could be sold for kindling, thereby slightly reducing the cost of the seed.

"The same saving in the cost of the seeds by carrying on the operation yourself is true not only of white pine but hardwood species as well.

"Take for instance the black cherry. Many people use the fruit for making wine. If cold water is used for soaking the meat from the stones, the seed are not injured as regards their germinating vitality and can be had for the asking."

The question here presents itself as to whether better germination can be expected from locally gathered seed than from seed gathered where climatic conditions are different. Opinions respecting this differ and I do not know that experiments have proved anything definite. There is a possibility that a part of the seed's vitality, in the case of shipped-in seed, is expended in overcoming somewhat adverse conditions due to a change in climate.

Mr. Bietsch further states that this home gathered white pine seed produced healthier seedlings than that received from a commercial house and that his results in 1913 far exceeded past efforts along this line.

Mr. Mulford states that black cherry gathered in 1912 produced the best germination that the nursery has had with the species and continuing says: "Personal opinion is that local seed would give better results, if facilities for handling and storing were the same." Of course, there would be no use in collecting seed unless a suitable house for drying, cleaning, and storing were provided.

In this connection a statement by Hon. C. R. Pettis of Albany, N. Y., is of interest: "The first thing is to secure a good seed bed. At first we were not successful, because our seeds were not uniformly good. Then we began to collect our own seeds. This solved the problem, but one season had been spent in getting this much information."

This does not necessarily mean that locally gathered seed will produce best results, for results obtained are dependent upon the quality of the seed, and if the seed is not heavy, poor germination is to be expected. Heavy white pine seed, weighing 35 to 40 pounds to the bushel, is obtained in years of abundant seed crop or seed years, and in years when the crop is short the seed is usually light, weighing probably but 25 pounds to the bushel. Collections should be made only in regions where a seed year is in progress, for seed in an off year is apt to be lacking in vitality and frequently infertile.

SOIL. The character of the nursery soil may have everything to do with the success or failure of a nursery and invariably is a large factor in cost of production. It is an undisputed fact that a strong, healthy plant produced by proper plant foods will in permanent plantations withstand slightly adverse conditions and that its ability to overcome them is directly proportional to its strength; which, in turn, may be said to be directly proportional to the plant food in the soil, keeping in mind that the effects of soil are chiefly due to adjustment to water. Commercial nurserymen usually establish their nurseries on the best soil for such purposes and consequently expect to obtain strong, healthy plants because the soil contains the proper plant food. The State nurseries were established on the best soil available, but which, in most cases, is lacking in the requisite amount of fertility. This means that in order to raise strong, healthy, stocky seedlings, plant food must be put into the soil in the form of fertilizers, and this will add to their cost. Since experiments are necessary to determine just which plant foods each type of soil is deficient in, and many of the experiments will prove unsuccessful and cause the loss of seed and seedlings in certain beds, the total cost of production will be somewhat larger for several years, the number of seedlings produced somewhat smaller, and the average cost per thousand will be higher.

Fertilizer experiments in the Asaph, Greenwood, and Mont Alto nurseries are now being made under the direction of Prof. Netoffsky. These experiments were started with the 1913 spring seeding and will require another year before results can be determined.

NURSERY OPERATIONS.

Each nursery operation for seedling production has its proportional bearing on cost of seedlings, and the method of performing each operation may be an important factor in cost.

A few instances may be cited in connection with these operations which affect the number of seedlings produced and consequently are factors in cost.

MAKING BEDS.—In connection with making up nursery beds, the condition of the soil is important, for if too wet, puddling and later sun baking usually result, forming a crust through which the stem axis and cotyledons cannot force their way. Bietsch at Mont Alto and at Greenwood found that by working charcoal braize into the soil and thereby loosening it up, puddling and the resulting sun bake were reduced to a minimum. One cartload of braize was used to 100 square feet of bed surface. This braize also tends to make the Mont Alto soil more adaptable for conifers than it now is.

SOWING SEED.—In the matter of the best method of sowing coniferous seeds, there appears to be a difference of opinion, especially among members of this Department. For several years, Mulford at Asaph was under orders to sow only in drills, which orders were due to the fact that there is danger of large losses resulting from weeding in broadcast beds. However, in the spring of 1913, this order was revoked and they are now sowing a large part of the coniferous seed broadcast. It is true that drill sowing has certain advantages over broadcasting, but taking both methods into consideration, broadcasting seems to be the more advisable, under our usual conditions. Weeding in broadcast beds is practically eliminated after it has been done once or twice, and by exercising a little more than common care, the loss in seedlings pulled out need not be excessive. Suppose it does require twice as long to weed, it is still the better paying proposition since a broadcast bed may require only three or four weedings the first year, and probably none the second, if the seedlings stand as thickly as they should.

Then, again, from two to five times as many seedlings can be raised per unit of area, and if properly handled the quality should be as good. At Asaph several broadcast beds produced seedlings, white





Figure 1. A photograph of a dark, textured surface, possibly a book cover or endpaper, showing vertical lines and a small white mark near the top right corner.





Book cover design. The book cover is made of dark material.

pine and Norway spruce, which were equal in quality to their drill sowed. Scarcely any difference could be seen in the root systems nor in the size of stem or top.

However, each nurseryman must be impressed with the fact that the greatest care must be taken in weeding or too many seedlings will be pulled out, leaving a too open stand and resulting in additional weeding and less stocky root systems. Experiments in the case of white pine have shown that approximately one pound of seed to 100 square feet produces the best results.

HANDLING OF SHADES.—Careful attention must be given the management of shades, particularly over the first year beds, for upon them largely depend two great factors in seedling production. On the one hand is the danger of sun baking of the soil, and, on the other, damping off resulting from an over-wet soil usually combined with humid atmospheric conditions. If seed beds are allowed to dry off quickly unprotected by shades, a crust is more than likely to be formed through which the germinating seed cannot force its way. Consequently the nurseryman must exercise good judgment for if shades are removed when the sun's rays are very intense, sun baking and crusting of the soil may follow. Probably the safest plan is to allow the shades on the beds only during the middle of the day, say from 10 or 11 A. M. to 2 or 3 P. M.

The most critical time in the life of a seedling is a period of 4 to 6 weeks after germination, for it is then that the damping off fungus works and may cut the yield in beds of good germination 50 per cent, and in cases may result in a total loss of the bed. Control of this disease has proved difficult, even in German nurseries. Careful manipulation of the shades, allowing for proper aeration of the beds, and sprinkling sand on the beds are most commonly adhered to. Spraying with Bordeaux mixture is claimed to be a preventive and, I believe, is used by the Germans as such; but it will not destroy the fungus after it has attacked the seedling.

WATERING.—There is almost no danger of nursery beds becoming too dry in the spring, but watering is frequently necessary during the hot summer months. This results in two more factors of importance which have to do with the cost of production. If watering of seedling beds is done during the day when the sun's rays are intense, scalding of the seedlings can scarcely be avoided. To eliminate this danger, watering should be done in the evening, but labor is not always available at that time of day. Consequently the forester in charge frequently performs this operation himself, and must make a charge against the seedlings at the rate of 40 or 50 cents per hour for work which should not cost more than 15 to 18 cents per hour. This results in an inflated cost of production.

MULCHING.—The method of and the material used in mulching, whether it be on seed beds or for winter protection, may prove a factor of considerable importance in the cost of seedling production. Where a mulch is put on seed beds, whether it be pine needles, straw, burlap, or any other material, sun baking of the soil is prevented; but if too heavy, excessive heating or moulding of the soil and seeds may occur. Opinions differ as to the material best adapted for mulching. Burlap has proved to be good. Straw works well but is apt to contain weed seeds which result in added cost for weeding. Pine needles may be safely advised and are especially satisfactory where a light layer of mulch is left on the beds after germination has taken place. This is advised and practiced by Bietsch in the Greenwood nursery. Crusting of the soil is prevented, weeds are kept down, and a small amount of organic matter is added to the soil. However, there is added danger in a wet season of damping off occurring and close attention must be paid to the amount of soil moisture.

In raking off straw or pine needles from seed beds during the germinating period there is danger of losing many seedlings if done when the seed husks are still attached to the cotyledons. In seed germination the first part of a plant to shoot out is the radicle or root tip which at once turns downward and enters the soil. When the caulicle or stem portion of the seed is extricated, it shows response to light and turns upward, usually carrying with it the cotyledons or seed leaves, from which the plantlet gets its food supply until it has established a root system. In raking off the mulch, the cotyledons are often injured before the root system is established, resulting in the death of the little plant.

With winter mulch on seedling or transplant beds the thickness required depends directly on the severity of the winter. If too heavy, heating and moulding may occur. If too light, winter heaving from frost may result. The latter is especially true with transplant beds.

Other Factors Influencing Cost of Seedlings.

Influences outside of nursery operations frequently have an important bearing on seedling production. One of these, forest fires, has often entered as a factor; for the spring fire season occurs about the time of rush nursery work and a fire may take all labor away from the nursery in the midst of lifting seedlings for shipment or when the soil is just right for seed sowing. It is important to sow seed when the soil is in proper condition, not too wet, for then the seed may rot; nor too dry, for then germination is impaired; nor should seeding be done too late in the season, for then the seedlings are more than likely to be stunted, requiring them to remain in the beds

an additional year. Late sowing may also result in unripened tissue in the little plant which will then not be able to withstand frosts and the cold of winter.

Fires have caused delays in seeding with the resultant loss of a large percentage of seedlings which should have been obtained from the amount of seed sowed.

This conflict of nursery work and fire protection is a big argument in favor of a centralized nursery, for in that case a nurseryman's entire time could be devoted to the nursery. Then, too, if it were situate in an agricultural region away from the State Forests, it would not be necessary to neglect nursery work to fight fires.

Since conditions vary in State and commercial nurseries, a comparison of costs is not altogether reliable and it is unfair to draw definite conclusions from it. In the first place, virgin nursery charges are usually excessive, and as our large nurseries were all established at different times, it has not been practical in the past to compare costs of production. However, the three are now firmly established and if records are kept in a uniform manner, comparison of costs can be made among them and conclusions arrived at with some degree of fairness. This is not true of comparisons between the State and commercial nurseries, due largely to different methods of charging nursery stock. Then, too, the business of raising seedlings by the State is observed from a different point of view. In commercial nursery work surplus stock is put on the market for what it will bring, cash for the lot, and seedlings offered us at very low prices are this surplus stock. The better class of seedlings is sold in small quantities at fancy prices. Many of these small quantity sales allow disposal of inferior stock at rates below actual cost of production. Even though the surplus is not inferior, it must be disposed of and consequently a low price is quoted. The loss is more than made up by the small-quantity-at-fancy-price sales. The man who gets the advantage of low quotations is fortunate and frequently we might take advantage of them; but would it be wise to trust to obtaining our annual supply in this way? I think not, for commercial nurserymen would not be apt to quote us the low prices if they knew we were dependent upon them for our supply.

NURSERY RECORDS.

Too much emphasis cannot be placed upon the importance of keeping nursery records and keeping them in such form that figures on cost of production may be easily obtained at any time. Many difficulties present themselves when it comes to making up these costs, but if the co-operation of the nurserymen can be had there is no reason why we cannot have reliable figures, providing a uniform system of nursery records is adopted. Methods of charging nursery stock may vary with each nurseryman. The tabulation of data is made difficult, unreliable, and frequently entirely out of the question.

A set of forms for keeping nursery records was worked up which it was thought would cover the needs of the nurserymen and from which data on costs and production could be easily and quickly obtained at any time. The first form, that for Bed Records, was to cover the cost of production and seedlings produced from a set of beds sowed with any one species and treated in like manner. This form was to be filled out at the time of performing any particular operation or of taking special notes as to germination, damage to beds, rate of growth, etc. With the small nurseries this form could be used for original entry, but with the large ones the Daily Record forms should be used and the material later transferred to the Bed Record sheets where all data pertaining to a set of beds would be collected together in compact form.

The second form was for a Summary of Operations to be submitted to this office with the foresters annual report. The third was the Growing Stock Inventory upon which would be given the inventory of seedlings, transplants, and cuttings by species and by age.

The first two forms did not meet with the approval of the nurserymen, largely because extra work would have been necessary in filling them out. Consequently they have since been materially changed. I believe one at least, that for Bed Records, is practical and will, if properly filled out, make reliable nursery data available from each nursery.

In order that something definite be done toward adopting a definite and uniform system of keeping nursery records, Mr. Wirt suggested that several of the nurserymen be called into the office to discuss the system we have worked out and to decide on some one system to follow. I therefore suggest that the following men be directed to report at this office for a discussion of this matter: E. A. Ziegler or Geo. A. Retan; Paul H. Mulford, Tom O. Bietsch, Robert G. Conklin, Wm. F. Dague.

Each should be supplied in advance with a set of the forms for study so that he would be able to discuss them intelligently while here. All parts of the forms should be given thorough study and I believe an agreement on a definite system could be arrived at.

If other nurseries, state, national, and commercial, can keep detailed records, there is no substantial reason why our nurseries cannot do so.

A large part of the information contained in the foregoing report was derived from the records, experiments, and experience of Tom O. Bietsch of Greenwood and Paul H. Mulford of Asaph. Credit is also due to Prof. Netoffsky, of the State Forest Academy, Mont Alto.

TIMBER SALES.

A contract under date of January 13, 1912, was entered into with C. D. Raker of North Bend, Clinton county, for the sale of mine props, sawed lumber, paper wood, and railroad ties, to be made from undesirable timber standing on a tract of about 200 acres at the head of Boggs Run in the Hopkins State Forest. Contract is subject to the usual precautions against damage from forest fire and other unskillful handling. Lopping of tops is to proceed with the cutting. Contract is accompanied by a bond in the sum of \$1,000 with security. To the end of the period covered by this report, Mr. Raker has removed and paid for material to the value of \$3,498.81.

An agreement dated January 25, 1912, was entered into with G. W. Huntley and O. L. Bailey of Sinnemahoning for the removal of undesirable timber at the head of Wykoff and Upper Jerry Runs in the Sinnemahoning State Forest, over an area approximating 400 acres. Material is to be paid for at the rate of \$3.05 per thousand feet mill cut, and the contractors have eighteen (18) months in which to finish their work. Lopping of tops is to proceed with the cutting. A bond in the sum of \$2,000 with corporate security, accompanies the contract. To the end of the period covered by this report, the contractors have paid to the Department \$4,505.33 for material so removed.

On February 19, 1912, a contract was entered into with L. L. Weaver of Woodward, Centre county, for the removal of the undesirable hemlock, white pine, and yellow pine within the State Forest south of Woodward, and \$2.00 per thousand feet mill cut was the price to be paid. Contract runs to the first day of March, 1914,

and is accompanied by bond in the sum of \$150.00. The usual precautions against forest fires are required to be taken and the lopping of all branches must be done as the work proceeds. Amount paid on this contract to December 31, 1913, is \$421.66.

On December 10, 1912, an agreement was entered into with Henry Steline for the dead and down chestnut wood on two tracts within the Bald Eagle Forest at 30 cents per cord stumpage. All wood is to be paid for as removed and no bond was required. To December 31, 1913, this contract has yielded \$90.86.

On January 28, 1913, an agreement was entered into with Alfred Krise, of Odessa, for the removal of the dead and down hemlock and jack pine, from a portion of the State Forest in Goshen township, Clearfield county, the price to be paid being \$1.50 per thousand feet board measure. Contract requires the usual precautions against damage and is to be completed by the first day of April, 1914. Receipts to December 31, 1913, from this contract are \$28.59.

On March 13, 1913, a contract was entered into with S. D. Longenecker of Petersburg, Huntingdon county, for the removal of dead chestnut from the Barree Division of the Seven Mountain State Forest. The material so taken is to be cut into fence posts and the price to be paid by the contractor is 1 cent for each post. All work to be done under the supervision of the forester. The returns to December 31, 1913, are \$30.38.

On May 27, 1913, an agreement was entered into with L. D. Gifford of Shirley township, Huntingdon county, by means of which he was permitted to take 200,000 board feet of hyper-mature timber from the Rothrock State Forest, in return for leaving upon lands recently purchased from him a large quantity of young and thrifty hardwoods, consisting of oak, hickory, and walnut. The size limit is 16 inches at one foot from the ground, and all brush and tops are to be carefully lopped and disposed of so as to prevent danger from fire. The grantee was permitted to have erected a saw mill upon the premises for the purpose of working up the material, the same to be run under the usual precautions.

On the 29th of May, 1913, an agreement was entered into with Calvin Bush and Bush Miller of East Stroudsburg, R. D. No. 2, Monroe county, for the purchase and removal of certain timber suitable for making railroad ties, upon warrants Nos. 59 and 61, Middle Smithfield township, Monroe county. The usual precaution against damage is required to be taken, and the contract is to be completed within 1½ years from date. This contract has been cancelled, and has yielded no return.

On September 2, 1913, an agreement was entered into with S. Hostrander of Okome, for the sale and removal of fire damaged timber on warrants 1652, 1653, 1524, and 1525 on the Waterville division

of the Black Forest. The price to be paid therefor is \$4.00 per thousand mill cut for sawed lumber, \$1.30 for mine props, and 15 cents for ties. The usual precaution against damage is required. Contract is accompanied by a bond of \$250.00 and the operation is to be finished on or before the 28th day of February, 1915. No returns to date under this contract have been received.

On September 23, 1913, a contract was entered into with F. A. Vickery of Bodines, and Carson Clendenning and J. F. Fleming of Trout Run, for the sale and removal of certain cull and over-mature hardwoods from within the Grays Run State Forest. Cord wood is to be paid for at the rate of 50 cents per cord of 160 feet, and all timber at the rate of \$2.05 per thousand feet mill cut. Bond in the sum of \$500.00 accompanies the contract, and the usual precautions against damage are required. No returns to date under this contract have been received.

On October 15, 1913, an agreement was entered into with Damon Watson of Costello, Potter county, for the removal of certain over-mature, dead, and declining trees within the State Forest around the headwaters of Stony Lick Creek in Summit township, Potter county, at the price of \$3.50 per thousand feet mill cut. A bond in the sum of \$100.00 accompanies the contract, and the usual precautions against damage are required to be taken. No returns to date under this contract have been received.

On the first day of November, 1913, an agreement was entered into with H. B. Walker of Conrad, for the removal of dead, dying, and down timber from within the State Forest in Murdock Hollow, Summit township, Potter county, at the rate of \$3.50 per thousand feet mill cut, the usual precautions against damage being required. A bond in the sum of \$100.00 accompanies the contract. No returns to date under this contract have been received.

On the 22d of November, 1913, a contract was entered into with George Welschans of Lloyd, for the removal of certain prop timber within the State Forest in Brown township, Lycoming county. Price to be paid therefor is \$1.00 per ton, railroad weight, and the usual precautions are to be taken against damage. In place of the ordinary bond, an arrangement was made whereby the Department should receive the first payment out of sales made to consignees. No returns to date under this contract have been received.

On December 27, 1913, a contract was entered into with William H. Libby of Millmont, R. D., Union county, for the removal of certain undesirable hardwoods, hemlock, and pine within what is known as Henstep Gap in the State Forest, Hartley township, Union county; land in the warrantee names of John Hassinger and James Dillswarth. The usual precautions are required to be taken. The material to be removed will include saw timber, railroad ties, prop

timber, pulp wood, and extract wood. Payments to be made quarterly. Contract is accompanied by a bond in the sum of \$500.00. No returns to date made under this contract.

On December 29, 1913, an agreement was entered into with Geo. B. Hilborn of Cedar Run, Lycoming county, for the removal of the dying, dead, and down timber on four warrants in Elk township, Tioga county, at the rate of \$2.85 per thousand feet. The lopping of branches and other usual precautions are required. The contract is accompanied by a bond in the sum of \$150.00. The contract is to be completed by June 1, 1915. To date there are no returns from this contract.

SURVEYS.

The Chief Surveyor and Draftsman of the Department is S. T. Moore, who reports the activities of his office for the years 1912 and 1913. Many surveys during the current period were directed to locations for improvements. These consisted of the erection of new buildings, the repair of old buildings, installation of water systems, and such other forest development as needed the services of a surveyor.

1912.

February 26th, the survey of the disputed location of the Ann Ross warrant in Lycoming county was begun with Foresters Bietsch, Fox, and Smith.

May 6th, the correction survey of Grays Run with Foresters Wells and McNeal.

June 5th, survey for improvement at Ranger Frank's, Pike county.

July 8th, survey for improvement at Pump Station, Lycoming county, with Forester Thomson.

August 12th, began installation of water supply for Ranger Frank.

August 21st, disputed ownership of the "Crissman" lands by T. W. Lauver, investigated. Survey made with Foresters Warfield and McNeal, and Ranger Wirth.

September 12th, survey for purchase from East Penn Lumber Co., Monroe county, with Forester Strobeck.

October 7th, survey for purchase of land from Maude L. Gifford, Huntingdon county, with Forester Bodine.

November 18th, survey for disputed line in Clinton county, with Surveyor Wetzel and Forester J. B. Ryon.

1913.

April and May, C. L. Wetzel with Forester Bryner, and Rangers Koontz and Hart, made connection surveys adding new purchases to our older survey, in Perry county.

April 28th, began general repairs and new buildings at Ranger Gibboney's, Huntingdon county.

June 28th, survey for gravity water supply for Graeffenburg Nursery and Inn, Franklin county, from a spring of pure water on the mountains, to replace the pumping system from the creek. Forester Robert G. Conklin assisted in the work.

July 21st, survey for new house, barn, water supply, and grading at Leetonia, Tioga county, for use of Ranger Robert Schwab, with Forester Keller and Ranger Schwab.

August, surveyor C. L. Wetzel sent to Whetham, Clinton county, with Forester J. B. Ryon, to begin the survey of the Whetham Forest. Continued until November, when the work was stopped on account of inclement weather.

November 7th, survey for water supply from Gifford Spring, Huntingdon county, for the future residence of Forester A. W. Bodine, and beginning of actual work at the spring.

November 24th, survey for water supply and general remodeling at Pine Gove Furnace, Cumberland county, with Forester John R. Williams.

MAPS.

The following maps were connected from official drafts, copies of which were obtained from the Department of Internal Affairs. The maps are enlarged connections, joined together to make standard maps, three feet by eight feet. Only those who have done this class of drafting can appreciate the time and labor necessary to join single drafts together properly, in order to make a large map. So many of the original returns of local surveyors vary both in courses and distances, and many surveys interfere with others, that actual work on the ground is often necessary to determine which is the correct return. The maps now made are of the new series adopted two years ago, and are of uniform scale and size.

Map G-7, Union county, completed by Forester Tom O. Bietsch.

Map D-3, Cameron and Elk counties, completed by Forester J. E. McNeal.

Map E-4, Clinton and Cameron counties, completed by Forester P. H. Fox.

Map F-7, Clinton, Centre, and Union counties, completed by Forester John R. Williams.

Map F-6, Clinton, Lycoming, and Union counties, completed by Forester J. E. McNeal.

A number of smaller drafts, maps, and plans were made for use of the Department and the foresters, as well as plans for buildings to be erected or remodeled.

During the two years the Chief Draftsman was assigned to superintend the erection of a new barn, repairs to houses, and boring of three wells at the Pump Station property in Lycoming county; also to make changes in buildings occupied by foresters or rangers within the State Forest, including the erection of new buildings, the installation of water systems, and other necessary work. During his absence Forester J. E. McNeal was in charge of the drafting.

FORESTERS' MAPS.

As the foresters advanced in experience, it was found necessary to produce single maps for each, including only the immediate forest, and on as large a scale as convenient. These maps contain the warrant names or numbers, county and township lines, roads, streams, mountains, planting, and improvements, as an aid to forest work. A list of these follows, showing the number, county, forest, division, forester, draftsman, and date of finishing the map. All have been traced, negatived, and printed on white cloth with blue lines so that the forester can add additional data as they are derived. When sufficient has accumulated, it will be added to the tracing, new negatives made, and new prints substituted for the old.

These maps are very much sought after by land adjoiners, historians, sportsmen, and others.

FORESTER'S MAPS.

Number.	County.	Forest.	Division.	Forester.	Draftsman.
1	Snyder,	Seven Mountain,..	Jacks Mountain,..	W. G. Conklin, ..	W. G. Conklin.
5	Tioga,	Stone,	Asaph,	P. H. Mulford, ..	M. Mustin.
6	Tioga,	Stone,	Chatham,	C. O. Miner,	M. Mustin.
7	Cameron,	Sinnemahoning, ..	Medix,	J. A. Irvin,	J. A. Irvin.
21	Lycoming,	Black Forest, ....	.....	H. A. Thomson, ..	W. M. Mumma.
22	Lycoming,	Black Forest,	Slate Run,	F. D. Jerald,	J. A. Irvin.
28	Union,	White Deer,	Buffalo,	A. C. Silvius, ...	J. E. McNeal.
8	Potter,	Sinnemahoning, ..	Hull,	H. L. Vail,	W. M. Mumma.
11	Cameron,	Sinnemahoning, ..	Cameron,	H. E. Elliott, ...	W. M. Mumma.
16	Mifflin,	Seven Mountain,..	Kishacoquillas, ..	D. K. Warfield, ..	J. A. Irvin.
23	Tioga,	Black Forest,	Blackwells,	J. W. Keller,	J. A. Irvin.
29	Union,	White Deer,	McCall,	R. B. Winter, ...	J. E. McNeal.
13	Huntingdon,	Seven Mountain,..	Greenwood,	T. O. Bietsch, ...	W. E. Houpt.
19	Centre,	Hopkins,	Snow Shoe,	G. W. Sheeler, ..	W. M. Mumma.
24	Lycoming,	Black Forest,	Waterville,	H. C. Evans,	M. Mustin.
32	Clearfield,	Clearfield,	Penfield,	C. L. Kirk,	J. A. Irvin.
34	Potter,	Kettle Creek,	Crossfork,	R. L. Emerick, ..	W. M. Mumma.
35	Clinton,	Kettle Creek,	Leidy,	J. L. MacAvoy, ..	J. L. McAvoy.
36	Pike,	Minisink,	Notch,	J. E. Avery,	W. E. Houpt.
39	Pike,	Minisink,	Shohola, .....	.....	J. A. Irvin.
48	Lackawanna,	Lackawanna,	Bear Lake, .....	.....	M. Mustin.
50	Lycoming & Tioga, ..	Black Forest,	Blackwells, .....	.....	J. W. Keller.
32	Clearfield,	Clearfield,	Clearfield,	W. F. Dague, ...	M. Mustin.

NEW SERIES MAPS.

Map.	Traced by	Connected by	County.
F4	H. J. Mueller,	W. E. Houpt,	Lycoming.
G4	W. E. Houpt,	W. E. Houpt,	Lycoming and Sullivan.
E3	J. E. McNeal,	J. E. McNeal,	Potter and Clinton.
D5	S. T. Moore,	T. O. Bietsch,	Elk and Clearfield.
G7	T. O. Bietsch,	T. O. Bietsch,	Union (River end).
D3	J. E. McNeal,	J. E. McNeal,	Cameron and Elk.
E4	P. H. Fox,	P. H. Fox,	Clinton and Cameron.
F7	J. R. Williams,	J. R. Williams,	Clinton, Centre, and Union.
F6	J. E. McNeal,	J. E. McNeal,	Clinton, Lycoming, and Union.
F7	J. E. McNeal,	J. E. McNeal,	Clinton and Lycoming.
E5	J. E. McNeal,	J. E. McNeal,	Cameron, Clinton, and Centre.
D6	M. Mustin,	M. Mustin,	Clearfield.

LAND GRANT APPLICATIONS.

During the years covered by this report, the Secretary of Internal Affairs, in accordance with the provisions of the act of May 3, 1909, P. L. 413, has submitted to the Department the applications made by individuals for warrants to survey vacant lands. The following are the applications referred during the period named, showing the action of the Department in each case:

Number.	Character of Tract.	Acres.	Perches.	Township.	County.	Name of Applicant.	Date Application Received.	Action of Forestry Commission.
52	Unimproved vacant land...	13	147	Geulich,	Clearfield,	H. E. Fulkerson,	January 25, 1912, ...	Declined.
53	Unimproved vacant land...	62.1	...	Middle Paxton,	Dauphin,	Peoples Ice Co.,	February 12, 1912, ...	Declined.
54	Unimproved vacant land...	20	...	Middle Paxton,	Dauphin,	Peoples Ice Co.,	February 12, 1912, ...	Declined.
55	Unimproved vacant land...	30	...	Middle Paxton,	Dauphin,	Peoples Ice Co.,	February 12, 1912, ...	Declined.
56	Unimproved vacant land...	50	...	Broad Top and West Providence,	Bedford,	H. O. Garlick,	May 8, 1912,	Declined.
57	Unimproved vacant land...	18	127	Monroe,	Bedford,	Margaret Pittman,	May 23, 1912,	Declined.
58	Vacant island,	1	90	Fulton,	Lancaster,	Maurice J. Brinton,	June 11, 1912,	Declined.
59	Vacant island, .....	...	104	Fulton,	Lancaster,	Maurice J. Brinton,	June 11, 1912,	Declined.
60	Unimproved vacant land...	0.188	...	Menallen,	Fayette,	Edmund L. Zearley,	June 10, 1912,	Declined.
61	Unimproved vacant land...	6	...	Hopewell,	Bedford,	Edwin S. Hinsh,	June 10, 1912,	Declined.
62	Unimproved vacant land...	...	46	Johnstown City,	Cambria,	Dorsey P. Keim,	October 1, 1912, ...	Declined.
63	Vacant island,	1	154	Middle Paxton,	Dauphin,	C. L. Hyers,	October 11, 1912, ...	Declined.
64	100 vacant islands,	181.15	...	Fulton and Drumore,	Lancaster,	Geo. R. Hurlow,	November 1, 1912, ...	Declined.
65	Unimproved vacant land...	...	584	Pottsgrove,	Montgomery,	Edward B. Cook,	November 1, 1912, ...	Declined.
66	Vacant island,	1	138	Drumore,	Lancaster,	W. H. Cramer,	November 12, 1912, ...	Declined.
67	Vacant island,	2	55	Drumore,	Lancaster,	W. H. Cramer,	November 12, 1912, ...	Declined.
68	Vacant island,	0.581	...	Fulton,	Lancaster,	Will Shank,	November 21, 1912, ...	Declined.
69	Vacant island,	0.875	...	Fulton,	Lancaster,	Marvin E. Bushong,	December 7, 1912, ...	Declined.
70	Vacant island,	1.515	...	Drumore,	Lancaster,	Marvin E. Bushong,	November 21, 1912, ...	Declined.
71	Vacant island,	1.245	...	Drumore,	Lancaster,	Marvin E. Bushong,	November 21, 1912, ...	Declined.
72	Vacant island,	1.537	...	Drumore,	Lancaster,	Marvin E. Bushong,	November 21, 1912, ...	Declined.
73	Unimproved vacant land...	10	57	Cass,	Huntingdon,	Amos Evans,	February 17, 1913, ...	Declined.
74	Unimproved vacant land...	27	120	Lehman,	Pike,	Henry S. Smoyer,	August 12, 1913, ...	Declined.
75	Unimproved vacant land...	6	154	College,	Centre,	W. Reynolds Shope and M. R. Shope,	August 1, 1913,	Declined and later accepted.
76	Unimproved vacant land...	8	60	Fairfield,	Westmoreland, ..	John Snodgrass,	October 15, 1913, ...	Declined.
77	Unimproved vacant land...	13	56	Fairfield,	Westmoreland, ..	John Snodgrass,	October 16, 1913, ...	Declined.
78	Vacant island,	1	53	Harrisburg City,	Dauphin,	B. J. H. Douglass,	November 18, 1913, ...	Declined.
79	Vacant island,	2	53	Harrisburg City,	Dauphin,	Theodore Rodkey,	November 18, 1913, ...	Declined.

FIXED CHARGES ON STATE LAND.

A statement of the amount paid for road and school purposes in 1912 and 1913 under the act of April 5, 1905, P. L. 111, and the act of May 13, 1909, P. L. 744. The appropriation out of which the funds for 1912 were paid was made by specific acts of assembly approved the 14th day of June 1911. (See Appropriation acts 1911, pp. 299 and 300); and the sums paid for the year 1913 were derived by specific appropriations contained in the general appropriation act of 1911, P. L. 779.

1912.

County.	Township.	Acres for road purposes.	Amount paid for road purposes.	Acres for school purposes.	Amount paid for school purposes.
Adams,	Franklin,	11,128	\$222 56	11,128	\$222 56
Adams,	Hamiltonban,	4,746	94 92	4,746	94 92
Adams,	Menallen,	2,262	45 24	2,262	45 24
Bedford,	Colesrain,	2,167	43 34	2,167	43 34
Bedford,	Cumberland Valley,	749	14 98	749	14 98
Bedford,	Southampton,	7,102	142 04	7,102	142 04
Cameron,	Gibson,	26,049	520 98	20,487	409 74
Cameron,	Grove,	30,097	601 94	23,489	469 78
Cameron,	Independent District,			12,170	243 40
Cameron,	Lumber,	15,241	304 82	15,241	304 82
Cameron,	Portage,	2,463	49 26	2,463	49 26
Cameron,	Shippen,	6,997	139 94	6,997	139 94
Centre,	Burnside,	20,980	419 60	20,980	419 60
Centre,	Benner,	96	1 92	96	1 92
Centre,	College,	841	16 82	841	16 82
Centre,	Curtin,	2,453	49 06	2,453	49 06
Centre,	Ferguson,	925	18 50	925	18 50
Centre,	Gregg,	2,907	58 14	2,907	58 14
Centre,	Haines,	14,382	287 64	14,382	287 64
Centre,	Harris,	11,229	224 58	11,229	224 58
Centre,	Miles,	7,999	159 98	7,999	159 98
Centre,	Penn,	4,244	84 88	4,244	84 88
Centre,	Potter,	7,598	151 96	7,598	151 96
Centre,	Rush,	3,038	60 76	3,038	60 76
Centre,	Spring,	1,957	39 14	1,957	39 14
Centre,	Walker,	1,523	30 46	1,523	30 46
Clearfield,	Covington,	483	9 66	483	9 66
Clearfield,	Glarad,	11,349	226 98	11,349	226 98
Clearfield,	Goshen,	1,964	39 28	1,964	39 28
Clearfield,	Huston,	8,491	169 82	8,491	169 82
Clearfield,	Karthaus,	7,138	142 76	7,138	142 76
Clearfield,	Pike,	1,930	38 60	1,930	38 60
Clearfield,	Pine (part of Lawrence for school purposes),	15,216	304 32	15,216	304 32
Clearfield,	Sandy,	610	12 20	610	12 20
Clearfield,	Union,	230	4 60	230	4 60

REPORT OF THE 1912—Continued.

Off. Doc.

County.	Township.	Acres for road purposes.	Amount paid for road purposes.	Acres for school purposes.	Amount paid for school purposes.
Clinton,	Beech Creek,	15,324	306 48	15,324	306 48
Clinton,	Castanea,	60	1 20	60	1 20
Clinton,	Chapman,	24,648	492 96	24,648	492 96
Clinton,	Colebrook,	721	14 42	721	14 42
Clinton,	Crawford,	1,586	31 72	1,586	31 72
Clinton,	East Keating,	3,137	62 74	.....	.....
Clinton,	Gallagher,	6,013	120 26	6,013	120 26
Clinton,	Greene,	2,394	47 88	2,394	47 88
Clinton,	Grugan,	9,514	190 28	9,514	190 28
Clinton,	Lamar,	4,071	81 42	4,071	81 42
Clinton,	Leldy,	18,557	371 14	18,557	371 14
Clinton,	Noves,	26,395	527 90	26,395	527 90
Clinton,	Pine Creek,	795	15 90	795	15 90
Clinton,	Wayne,	5,107	102 14	5,107	102 14
Clinton,	West Keating,	3,643	72 86	3,643	72 86
Clinton,	Woodward,	1,360	27 20	1,360	27 20
Cumberland,	Dickinson,	1,236	24 72	.....	.....
Cumberland,	Frankford,	199	3 98	199	3 98
Cumberland,	Hopewell,	444	8 88	444	8 88
Cumberland,	Southampton,	1,080	21 60	.....	.....
Cumberland,	Upper Mifflin,	269	5 38	269	5 38
Dauphin,	Jackson,	3,354	67 08	3,354	67 08
Elk,	Benezette,	16,536	330 72	16,536	330 72
Elk,	Horton,	283	5 66	283	5 66
Franklin,	Fannett,	3,668	73 36	3,668	73 36
Franklin,	Greene,	5,840	116 98	.....	.....
Franklin,	Guilford,	3,757	75 14	.....	.....
Franklin,	Hamilton,	994	19 88	.....	.....
Franklin,	Letterkenny,	3,197	63 94	3,197	63 94
Franklin,	Metal,	524	10 48	524	10 48
Franklin,	Peters,	538	10 76	.....	.....
Franklin,	Quincy,	10,193	203 86	10,193	203 86
Franklin,	Southampton,	3,573	71 46	.....	.....
Franklin,	Washington,	2,239	44 78	2,239	44 78
Fulton,	Dublin,	1,255	25 10	1,255	25 10
Fulton,	Tod,	5,045	100 90	5,045	100 90
Huntingdon,	Barree,	2,940	58 80	2,940	58 80
Huntingdon,	Brady,	295	5 90	295	5 90
Huntingdon,	Cass,	2,609	52 18	2,609	52 18
Huntingdon,	Franklin,	4,189	83 78	4,189	83 78
Huntingdon,	Jackson,	26,100	522 00	26,100	522 00
Huntingdon,	Lincoln,	855	17 10	855	17 10
Huntingdon,	Logan,	4,123	82 46	4,123	82 46
Huntingdon,	Miller,	2,562	51 24	2,562	51 24
Huntingdon,	Morris,	168	3 36	168	3 36
Huntingdon,	Penn,	613	12 26	613	12 26
Huntingdon,	Porter,	1,150	23 00	1,150	23 00
Huntingdon,	Shirley,	2,973	59 46	2,973	59 46
Huntingdon,	Spruce Creek,	221	4 42	221	4 42
Huntingdon,	Todd,	1,002	20 04	1,002	20 04
Huntingdon,	Union,	1,068	21 36	1,068	21 36
Huntingdon,	West,	5,745	114 90	5,745	114 90
Juniata,	Lack,	1,951	39 02	1,951	39 02
Juniata,	Milford,	109	2 18	109	2 18
Juniata,	Tuscarora,	1,118	22 36	1,118	22 36
Lackawanna,	Lehigh,	4,956	99 12	4,956	99 12
Lycoming,	Armstrong,	2,352	47 04	2,352	47 04
Lycoming,	Brady,	610	12 20	610	12 20
Lycoming,	Brown,	18,869	377 38	18,869	377 38
Lycoming,	Clinton,	2,233	44 66	2,233	44 66
Lycoming,	Cogan House,	375	7 50	375	7 50
Lycoming,	Cummings,	17,424	348 48	17,424	348 48
Lycoming,	Gamble,	4,530	90 60	4,530	90 60
Lycoming,	Lewis,	4,175	83 50	4,175	83 50
Lycoming,	Limestone,	819	16 38	819	16 38
Lycoming,	McHenry,	16,043	320 86	16,043	320 86
Lycoming,	McIntyre,	2,311	46 22	2,311	46 22

1912—Continued.

County.	Township.	Acres for road purposes.	Amount paid for road purposes.	Acres for school purposes.	Amount paid for school purposes.
Lycoming.	Nippenose.	110	2 20	110	2 20
Lycoming.	Plunketts Creek.	7,837	156 74	7,837	156 74
Lycoming.	Washington.	3,969	79 38	3,969	79 38
Lycoming.	Watson.	1,215	24 30	1,215	24 30
Midlin.	Armagh.	27,926	558 52	27,926	558 52
Midlin.	Bratton.	8,028	160 56	8,028	160 56
Midlin.	Brown.	5,871	117 42	5,871	117 42
Midlin.	Decatur.	942	18 84	942	18 84
Midlin.	Granville.	80	1 60	80	1 60
Midlin.	Menno.	314	6 28	314	6 28
Midlin.	Union.	202	4 04	202	4 04
Midlin.	Wayne.	6,163	123 26	6,163	123 26
Monroe.	Barrett.	856	17 12	856	17 12
Monroe.	Middle Smithfield.	1,546	30 90	1,546	30 90
Monroe.	Price.	3,996	79 92	3,996	79 92
Perry.	Jackson.	7,489	149 78	7,489	149 78
Perry.	Madison.	1,733	34 66	1,733	34 66
Perry.	Toboyne.	16,894	327 83	16,894	327 83
Perry.	Tyrone.	330	6 60	330	6 60
Pike.	Blooming Grove.	11,826	236 52	11,826	236 52
Pike.	Delaware.	1,272	25 44	1,272	25 44
Pike.	Dingman.	5,185	103 70	5,185	103 70
Pike.	Greene.	3,043	60 86	3,043	60 86
Pike.	Lackawaxen.	2,357	47 14	2,357	47 14
Pike.	Lehman.	3,627	72 54	3,627	72 54
Pike.	Milford.	782	15 64	782	15 64
Pike.	Palmyra.	3,310	66 20	3,310	66 20
Pike.	Porter.	20,631	412 62	20,631	412 62
Pike.	Shohola.	479	9 58	479	9 58
Pike.	Westfall.	3,161	63 22	2,909	58 18
Potter.	Abbott.	19,464	389 28	19,464	389 28
Potter.	Austin Borough.	564	11 28	564	11 28
Potter.	East Fork (attached to Eulalia for school purposes).	5,364	107 28	5,364	107 28
Potter.	Homer.	10,752	215 04	10,752	215 04
Potter.	Keating.	4,243	84 86	4,243	84 86
Potter.	Portage.	14,499	289 98	14,499	289 98
Potter.	Stewardson.	40,699	813 98	40,699	813 98
Potter.	Summit.	14,235	284 70	14,235	284 70
Potter.	Sylvania.	4,396	87 92	4,396	87 92
Potter.	West Branch.	876	17 52	876	17 52
Potter.	Wharton.	7,225	144 50	7,225	144 50
Snyder.	Adams.	3,642	72 84	3,642	72 84
Snyder.	Centre.	374	7 48	374	7 48
Snyder.	Franklin.	948	18 96	948	18 96
Snyder.	Perry.	1,000	20 00	1,000	20 00
Snyder.	Spring.	6,084	121 68	6,084	121 68
Snyder.	West Beaver.	4,013	80 26	4,013	80 26
Snyder.	West Perry.	3,025	60 50	3,025	60 50
Somerset.	Jefferson.	1,043	20 86	1,043	20 86
Somerset.	Jenner.	1,499	29 98	1,499	29 98
Somerset.	Lincoln.	925	18 50	925	18 50
Tioga.	Chatham.	1,188	23 76	1,188	23 76
Tioga.	Clymer.	744	14 88	744	14 88
Tioga.	Delmar.	5,529	110 58	5,529	110 58
Tioga.	Duncan.	1,052	21 04	1,052	21 04
Tioga.	Elk.	14,189	283 78	14,189	283 78
Tioga.	Middlebury.	1,956	39 10	1,956	39 10
Tioga.	Morris.	17,964	359 28	17,964	359 28
Tioga.	Shippen.	14,548	290 96	14,548	290 96
Union.	Hartley.	25,977	519 54	25,977	519 54
Union.	Lewis.	20,357	407 14	20,357	407 14
Union.	West Buffalo.	4,033	80 66	4,033	80 66
Union.	White Deer.	2,355	47 10	2,355	47 10
Westmoreland.	Cooke.	4,321	86 42	4,321	86 42
Westmoreland.	Ligonier.	744	14 88	744	14 88
Wyoming.	Eaton.	1,177	23 54	1,177	23 54
Total.		970,306	\$19,406 12	970,064	\$19,401 06

1913.

County.	Township.	Acres for road purposes.	Amount paid for road purposes.	Acres for school purposes.	Amount paid for school purposes.
Adams.	Franklin.	11,128	222 56	11,128	\$222 56
Adams.	Hamiltonban.	4,746	94 92	4,746	94 92
Adams.	Menallen.	3,194	63 88	3,194	63 88
Bedford.	Colerain.	2,167	43 34	2,167	43 34
Bedford.	Cumberland Valley.	749	14 98	749	14 98
Bedford.	Southampton.	7,102	142 04	7,102	142 04
Cameron.	Gibson.	28,049	520 98	20,487	400 74
Cameron.	Grove.	30,097	601 94	23,489	460 78
Cameron.	Independent District.			12,170	243 40
Cameron.	Lumber.	15,241	304 82	15,241	304 82
Cameron.	Portage.	2,463	49 26	2,463	49 26
Cameron.	Shippen.	6,997	139 94	6,997	139 94
Centre.	Burnside.	20,980	419 60	20,980	419 60
Centre.	Curtin.	2,453	49 06	2,453	49 06
Centre.	Ferguson.	925	18 50	925	18 50
Centre.	Gregg.	2,907	58 14	2,907	58 14
Centre.	Haines.	14,414	288 28	14,414	288 28
Centre.	Harris.	11,229	224 58	11,229	224 58
Centre.	Miles.	7,999	159 98	7,999	159 98
Centre.	Penn.	4,244	84 88	4,244	84 88
Centre.	Potter.	7,598	151 96	7,598	151 96
Centre.	Rush.	3,038	60 76	3,038	60 76
Centre.	Spring.	1,957	39 14	1,957	39 14
Centre.	Walker.	1,523	30 46	1,523	30 46
Clearfield.	Covington.	483	9 66	483	9 66
Clearfield.	Girard.	11,349	226 98	11,349	226 98
Clearfield.	Goshen.	1,964	39 28	1,964	39 28
Clearfield.	Huston.	8,491	169 82	8,491	169 82
Clearfield.	Karthus.	7,138	142 76	7,138	142 76
Clearfield.	Pike.	1,930	38 60	1,930	38 60
Clearfield.	Pine (part of Lawrence for school purposes).	15,216	304 32	15,216	304 32
Clearfield.	Sandy.	610	12 20	610	12 20
Clearfield.	Union.	230	4 60	230	4 60
Clinton.	Beech Creek.	15,324	306 48	15,324	306 48
Clinton.	Castanea.	60	1 20	60	1 20
Clinton.	Chapman.	24,648	492 96	24,648	492 96
Clinton.	Colebrook.	721	14 42	721	14 42
Clinton.	Crawford.	1,586	31 72	1,586	31 72
Clinton.	East Keating.	3,137	62 74	3,137	62 74
Clinton.	Gallagher.	6,063	121 26	6,063	121 26
Clinton.	Greene.	3,553	71 06	3,553	71 06
Clinton.	Grujan.	10,314	206 28	10,314	206 28
Clinton.	Lamar.	4,071	81 42	4,071	81 42
Clinton.	Ledy.	18,557	371 14	18,557	371 14
Clinton.	Noyes.	26,395	527 90	26,395	527 90
Clinton.	Pine Creek.	795	15 90	795	15 90
Clinton.	Wayne.	5,163	103 26	5,164	103 28
Clinton.	West Keating.	3,643	72 86	3,643	72 86
Clinton.	Woodward.	1,360	27 20	1,360	27 20
Cumberland.	Cooke.	5,532	110 64	5,532	110 64
Cumberland.	Dickinson.	1,236	24 72		
Cumberland.	Frankford.	199	3 98	199	3 98
Cumberland.	Hopewell.	444	8 88	444	8 88
Cumberland.	Newton.	98	1 96		
Cumberland.	Penn.	357	7 14	357	7 14
Cumberland.	Southampton.	1,156	23 12		
Cumberland.	Upper Mifflin.	269	5 38	269	5 38
Dauphin.	Jackson.	3,354	67 08	3,354	67 08
Elk.	Benezette.	14,556	291 12	14,556	291 12
Elk.	Horton.	233	5 66	233	5 66
Franklin.	Fannett.	3,668	73 36	3,668	73 36
Franklin.	Greene.	5,349	116 98		
Franklin.	Guilford.	3,704	74 08		
Franklin.	Hamilton.	994	19 88	994	19 88
Franklin.	Letterkenny.	3,197	63 94	3,197	63 94
Franklin.	Metal.	524	10 48	524	10 48

1913—Continued.

County.	Township.	Acres for road purposes.	Amount paid for road purposes.	Acres for school purposes.	Amount paid for school purposes.
Franklin,	Peters,	538	10 76	.....	.....
Franklin,	Quincy,	9,624	192 48	9,624	192 48
Franklin,	Southampton,	3,573	71 46	.....	.....
Franklin,	Washington,	2,239	44 78	2,239	44 78
Fulton,	Dublin,	1,255	26 10	1,255	26 10
Fulton,	Tod,	5,045	100 90	5,045	100 90
Huntingdon,	Barree,	2,940	58 80	2,940	58 80
Huntingdon,	Brady,	295	5 90	295	5 90
Huntingdon,	Cass,	2,609	52 18	2,609	52 18
Huntingdon,	Franklin,	4,189	83 78	4,189	83 78
Huntingdon,	Jackson,	26,100	522 00	26,100	522 00
Huntingdon,	Lincoln,	855	17 10	855	17 10
Huntingdon,	Logan,	4,123	82 46	4,123	82 46
Huntingdon,	Miller,	2,562	51 24	2,562	51 24
Huntingdon,	Morris,	168	3 36	168	3 36
Huntingdon,	Penn,	613	12 26	613	12 26
Huntingdon,	Porter,	1,150	23 00	1,150	23 00
Huntingdon,	Shirley,	2,973	59 46	2,973	59 46
Huntingdon,	Spruce Creek,	221	4 42	221	4 42
Huntingdon,	Tod,	1,002	20 04	1,002	20 04
Huntingdon,	Union,	1,068	21 36	1,068	21 36
Huntingdon,	West,	5,745	114 90	5,745	114 90
Juniata,	Lack,	1,951	39 02	1,951	39 02
Juniata,	Milford,	109	2 18	109	2 18
Juniata,	Tusculora,	1,118	22 36	1,118	22 36
Lackawanna,	Lehigh,	4,956	99 12	4,956	99 12
Lycoming,	Armstrong,	2,352	47 04	2,352	47 04
Lycoming,	Brady,	610	12 20	610	12 20
Lycoming,	Brown,	18,869	377 38	18,869	377 38
Lycoming,	Clinton,	2,233	44 66	2,233	44 66
Lycoming,	Cogan House,	375	7 50	375	7 50
Lycoming,	Cummings,	17,754	355 08	17,754	355 08
Lycoming,	Gamble,	5,107	102 14	5,107	102 14
Lycoming,	Lewis,	4,175	83 50	4,175	83 50
Lycoming,	Limestone,	819	16 38	819	16 38
Lycoming,	McHenry,	16,288	325 76	16,288	325 76
Lycoming,	McIntire,	2,311	46 22	2,311	46 22
Lycoming,	Nippenose,	110	2 20	110	2 20
Lycoming,	Plunketts Creek,	8,201	164 02	8,201	164 02
Lycoming,	Washington,	3,969	79 38	3,969	79 38
Lycoming,	Watson,	1,215	24 30	1,215	24 30
Mifflin,	Armagh,	27,926	558 52	27,926	558 52
Mifflin,	Bratton,	8,028	160 56	8,028	160 56
Mifflin,	Brown,	5,871	117 42	5,871	117 42
Mifflin,	Decatur,	942	18 84	942	18 84
Mifflin,	Granville,	80	1 60	80	1 60
Mifflin,	Manno,	314	6 28	314	6 28
Mifflin,	Union,	202	4 04	202	4 04
Mifflin,	Wayne,	6,163	123 26	6,163	123 26
Monroe,	Barrett,	858	17 16	858	17 16
Monroe,	Middle Smithfield,	1,545	30 90	1,545	30 90
Monroe,	Price,	3,998	79 96	3,998	79 96
Perry,	Jackson,	7,851	157 02	7,851	157 02
Perry,	Madison,	1,733	34 66	1,733	34 66
Perry,	Tohoyne,	16,460	329 20	16,460	329 20
Perry,	Tyrone,	330	6 60	.....	.....
Pike,	Blooming Grove,	11,826	236 52	11,826	236 52
Pike,	Delaware,	1,324	26 48	1,324	26 48
Pike,	Dingman,	5,185	103 70	5,185	103 70
Pike,	Greene,	3,043	60 86	3,043	60 86
Pike,	Lackawaxen,	2,357	47 14	2,357	47 14
Pike,	Lehman,	3,627	72 54	3,627	72 54
Pike,	Milford Independent District, ..	782	15 64	782	15 64
Pike,	Palmyra,	3,310	66 20	3,310	66 20
Pike,	Porter,	20,631	412 62	20,631	412 62
Pike,	Shohola,	479	9 58	479	9 58
Pike,	Westfall,	3,161	63 22	3,161	63 22

1913—Continued.

County.	Township.	Acres for road purposes.	Amount paid for road purposes.	Acres for school purposes.	Amount paid for school purposes.
Potter,	Abbott,	19,464	389 28	19,464	389 28
Potter,	Austin borough,	564	11 28	564	11 28
Potter,	East Fork (attached to Eulalia for school purposes)	5,364	107 28	5,364	107 28
Potter,	Homer,	10,802	216 04	10,802	216 04
Potter,	Keating,	4,243	84 86	4,243	84 86
Potter,	Portage,	14,499	289 98	14,499	289 98
Potter,	Stewardson,	40,749	814 98	40,749	814 98
Potter,	Summit,	14,276	285 52	14,276	285 52
Potter,	Sylvania,	4,396	87 92	4,396	87 92
Potter,	West Branch,	876	17 52	876	17 52
Potter,	Wharton,	7,225	144 50	7,225	144 50
Snyder,	Adams,	3,642	72 84	3,642	72 84
Snyder,	Centre,	374	7 48	374	7 48
Snyder,	Franklin,	948	18 96	948	18 96
Snyder,	Perry,	1,000	20 00	1,000	20 00
Snyder,	Spring,	6,084	121 68	6,084	121 68
Snyder,	West Beaver,	4,013	80 26	4,013	80 26
Snyder,	West Perry,	3,025	60 50	3,025	60 50
Somerset,	Jefferson,	1,043	20 86	1,043	20 86
Somerset,	Jenner,	1,499	29 98	1,499	29 98
Somerset,	Lincoln,	925	18 50	925	18 50
Tioga,	Chatham,	1,188	23 76	1,188	23 76
Tioga,	Clymer,	744	14 88	744	14 88
Tioga,	Delmar,	5,529	110 58	5,529	110 58
Tioga,	Duncan,	1,062	21 04	1,062	21 04
Tioga,	Elk,	14,296	285 90	14,296	285 90
Tioga,	Middlebury,	1,955	39 10	1,955	39 10
Tioga,	Morris,	18,067	361 34	18,067	361 34
Tioga,	Shippen,	14,576	291 52	14,576	291 52
Union,	Hartley,	26,088	521 76	26,088	521 76
Union,	Lewis,	20,768	415 36	20,768	415 36
Union,	West Buffalo,	4,033	80 66	4,033	80 66
Union,	White Deer,	2,356	47 10	2,356	47 10
Westmoreland,	Cooke,	4,321	86 42	4,321	86 42
Westmoreland,	Ligonier,	744	14 88	744	14 88
Wyoming,	Eaton,	1,177	23 54	1,177	23 54
Total, .....	.....	978,759	\$19,575 18	978,758	\$19,575 16

RECAPITULATION.

Total amount paid in 1912, \$38,807.20.		
970,306 acres at 2 cents per acre for road purposes,		\$19,406 12
970,064 acres at 2 cents per acre for school purposes,		19,401 08
		\$38,807 20
Total amount paid in 1913, \$39,150.34.		
978,759 acres at 2 cents per acre for road purposes,		\$19,575 18
978,758 acres at 2 cents per acre for school purposes,		19,575 16
		\$39,150 34

RIGHTS OF WAY.

By permit issued September 12, 1912, the State Highway Department has granted authority to the Department of Forestry to erect and maintain a telephone line between Waterville and Blackwells in the Black Forest along the public highway under control of the Highway Department, being State Highway routes Nos. 266 and 106.

On the 14th of September, 1912, the supervisors of Brown township, Lycoming county, for a nominal consideration, granted to the Department the privilege of building and maintaining a line of telephone along a public highway in said township connecting with the Pine Creek road, and making necessary crossings for the economical building of the line.

On October 19, 1912, an agreement was entered into with the Central Pennsylvania Lumber Co., granting unto that company a right of way 60 feet wide for a distance of 1,204 feet over a portion of the State Forest in warrant 4423, Elk township, Tioga county. This concession is to continue for a period of four years, during which time an annual sum of \$15.00 is to be paid for the privilege. The lessee is required to employ all the usual precautions against forest fire and other danger.

By agreement dated December 20, 1912, the Commonwealth was granted the right to attach a wire to 193 poles of the Southern Pipe Line Company along their right of way through the Mont Alto division of the South Mountain State Forest. This grant was in pursuance of a reservation contained in the deed by which the Pipe Line Company received the grant of a right of way through what is now State land from the then owner, the Mont Alto Iron Company, September 25, 1890. See Franklin county Deed Book 87, page 379. The said attachment was made for the purpose of carrying a line of telephone from forest headquarters at Mont Alto to the Muddy Swamp region in the neighborhood of Green Ridge.

On January 22, 1913, an agreement was entered into with the Rishel Lumber Co. of Loyalsock, granting to said company the privilege to use a certain rollway and certain forest roads within the State Forest, in order to enable the company to remove certain timber from an interior tract of land. The consideration for this grant was \$1.00 with a covenant containing the usual precautions against fire and other damage.

By agreement dated February 11, 1913, between the Cumberland Valley Telephone Co. and the Commonwealth of Pennsylvania, a

right is granted to the Commonwealth, in consideration of an annual charge of \$5.40, to attach two wires to be used for a telephone line to 54 poles belonging to the said company on the Caledonia division of the South Mountain State Forest. This lease is terminable after sixty days' notice, and is for the convenience of the forest employes within the above division.

On the 17th day of March, 1913, an agreement was entered into with T. R. Harter and John F. McCormick of Lock Haven, trading as T. R. Harter & Co., for a right of way for tramroad over two portions of warrant 1588, Morris township, Tioga county, for the consideration of \$5.00. The agreement is to subsist for a period of one year or longer, if lumbering operations are not completed by that time. All precautions relating to forest fire or other damage are required to be taken.

On the 15th day of September, 1911, an agreement was entered into with William Caprio, Anthony Grieco, Charles P. Grieco, and Vito Grieco of Lock Haven, trading as Caprio & Grieco, by which a right of way 60 feet wide is granted through a portion of the State Forest along Big Trough Creek for a period of twenty years, in return for an annual rental of \$20.00, which said lease was subsequently assigned by the lessees to the Juniata and Southern Railway Co., said assignment being made with the assent of the State Forestry Reservation Commission upon resolution duly adopted on the 4th day of April, 1913. The annual rentals on this lease have been regularly paid.

By four several agreements dated April 21, 1913 and May 7, 1913, Wentz Neidigh, A. N. Stambaugh, L. A. Clouse, and A. B. Couch, all of Andersonburg, Perry county, granted to the Commonwealth the right to build a telephone line over lands owned by the respective parties, for the purpose of connecting by telephone the forest ranger's house in Henry Valley with the main line through Sherman's Valley, thus giving telephone connection with the forester's headquarters at New Germantown. The consideration in each instance was nominal.

On the 27th day of May, 1913, an agreement was entered into with Maude L. Gifford of Shirley township, Huntingdon county, conveying the privilege of having and using certain water from State land for domestic and other purposes, and as much water as will flow through a pipe 1½ inches in diameter. This grant is in part consideration for the conveyance of lands made prior thereto by Maude L. Gifford to the Commonwealth.

By agreement dated June 17, 1913, between the New York Central and Hudson River Railroad Co. and the Commonwealth, the latter is granted the privilege of making certain telephone wire crossings over the rights of way and tracks of the railroad company at eight

different points along said right of way between Waterville and Blackwells in the Black Forest. The agreement is revocable on thirty days' notice. The telephone line so constructed is for the convenience of the State foresters and their employes in the above named forest.

By authority dated September 6, 1913, the Board of Supervisors of Price township, Monroe county, granted to the Commonwealth the right to erect poles and string wires along the Millerstown road in said township and use the same as a telephone line for the convenience of the forest employes of the Pocono Division of the Minisink Forest.

By agreement dated September 17, 1913, entered into with the Waynesboro Water Company, there was granted to said company the right to lay additional pipe through a portion of the Mont Alto Division of the South Mountain State Forest, for the conveyance of water from the reservoir of the company to the borough of Waynesboro. For this privilege the grantee paid a consideration of \$100.00 and agreed to observe the usual precautions in doing the work.

By agreement dated September 22, 1913, the Cumberland Valley Railroad Co., lessee, granted unto the Commonwealth for a nominal consideration, the right to place and maintain two telephone wires over and across the right of way and tracks of the railroad company at Fort Loudon, and to make wire attachments to 45 poles belonging to said company. This lease is terminable upon thirty days' notice. It is for the convenience of the forester located on the Buchanan State Forest.

By agreement dated October 24, 1913, between the Elk Tanning Co. and the Commonwealth of Pennsylvania, the right to construct a telephone line over lands belonging to the company for a distance of 120 rods, near Leetonia, within the Blackwells division of the Black Forest, was granted. The consideration therefor was nominal, with the right to the company to connect its instruments with the wires at Cedar Run and Leetonia, free of charge.

On November 11, 1913, the grant of a right of way 60 feet wide was made to the Central Penna. Lumber Co., to extend over a portion of warrant 4442, in Tioga county, a distance of about 610 rods. The right of way is to subsist for a period of 7 years at an annual rental of \$50.00. All the usual precautions against fire and other damage are to be taken.

By agreement dated November 28, 1913, between the Cresco and Greentown Telephone Company and the Commonwealth, certain telephone connections and privileges in relation thereto are granted to the Commonwealth by the said telephone company for the use and convenience of the forester located on the Pocono Division of the Minisink State Forest. The consideration therefor was the usual

nominal consideration of \$1.00, and the rentals accruing from the use of the line and telephones.

By action of the State Forestry Reservation Commission had on December 5, 1913, the borough of Mont Alto was granted the right to take and receive water for borough use from the Mont Alto Division of the South Mountain State Forest, with a right of way over the State land for a pipe line and the privilege to construct a reservoir.

On the 22d day of December, 1913, a lease was executed to the Beech Creek Extension Railroad Co. for a right of way within the Hopkins State Forest in Noyes and Grugan townships, Clinton county, for the purpose of building a railroad. This right of way extends along the southern bank of the west branch of the Susquehanna river for a distance of about 1,020 rods. The consideration for making the grant was the sum of \$1,000 in cash and the conveyance of a tract of land containing 415 acres in the warrantee name of Robert Irwin in Beech Creek township, Clinton county, reserving to the railroad company the use of water from a certain spring thereon located and a right of way for a pipe line from the spring over and through State land to the railroad.

By six several agreements bearing dates at different times throughout the year 1913, Messrs. G. Louis Dormoy, Stewart Albert, W. J. Price, C. A. Reese, George D. Pine, and Dr. J. B. Heller, all of Monroe county, granted to the Commonwealth the right of passage for short distances over their private property for a nominal consideration, the purpose being to construct a forest telephone line for the use of the Pocono Division of the Minisink State Forest.

PERMANENT CAMP LEASES AND TEMPORARY CAMPING PERMITS.

By act of the Legislature approved March 27, 1913, the Department of Forestry is authorized to lease small areas of land to church organizations, associations, societies, and individuals for the purpose of a permanent camping and outing ground. The term of such leases is limited to ten years. By action of the State Forestry Reservation Commission duly adopted on the second day of May, 1913, the following regulations were adopted for the government of such leaseholds:

The amount of annual rental which the lessee is to pay for the use of the above tract is \$....., the rental for the first year to be paid at the time of the execution of this agreement, and for each subsequent year on the anniversary date of this agreement and in advance for the then next succeeding year.

The tract herein leased shall not be used by the lessee to conduct a business of any character, nor for the sale of commodities, except where the Department shall deem such business necessary for the convenience and accommodation of the community and then only after the making of a proper application to the Department for special permission to conduct the same, provided the Department approve the application and direct that the lessee may conduct such business.

The lessee shall devote the tract herein leased to the primary purpose described in the Act of Assembly above recited, and shall not use the same nor permit any other person to use the same or to devote such tract to a use which may bring discredit and unfavorable public criticism upon the Department. Of the propriety of use the Department is hereby made the sole judge.

The lessee must prevent the pollution of springs and streams which may be upon the leased tract or nearby within the State Forest, or on private land, and must keep and maintain the leased area in a sanitary and sightly condition and comply with all the health inspection laws of the Commonwealth of Pennsylvania.

The lessee and all other persons who may be entitled to participate in the use of said tract or may be invited as guests to participate with the lessee in the use of the premises, must respect and obey all laws now made or which hereafter may be made relating to forests, fish and game. The careless use of fire upon said tract or in any buildings which may be thereon erected, and the wanton discharge of fire arms therein or thereon, are prohibited. Fire must not be permitted to run from the leased area out into the forest, and all chimneys on any buildings which may be erected thereon shall be so constructed as to minimize the danger of forest fires from sparks issuing therefrom. The building of bonfires is forbidden. The use of fire works and the sending up of rockets and fire or toy balloons is prohibited. Burning matches or hot ashes from pipes must not be thrown about in a careless manner or among inflammable material.

The right of ingress to and egress from the leased area and the privilege to enter thereon at all times and as often as may be desirable on the part of the lessee or by those authorized by him, for all proper purposes, is hereby assured to the lessee.

The gathering of flowers from the wild herbaceous plants of the woods to be used for ordinary decorative purposes is not objectionable, but should be exercised by the lessee and those occupying the premises with him in such moderation that wild plants may not

become extinct in the neighborhood. The destruction of growing trees or ornamental shrubbery or any injury thereto is prohibited, except the same be done with the permission of the Department.

The Department reserves the right to fix the location of any building which the lessee may desire to erect upon the leased area, and to determine the minimum value of such building. All plans and specifications for the erection of buildings shall, at the call of the Department, be submitted for criticism and inspection and be accompanied by a certificate of the architect or builder, as to the minimum cost of such building.

Should the lessee desire simply to erect tents and tent floors instead of building a more permanent kind of structure, the same shall be deemed to come within the purview of the act and within the authority granted by this lease.

Every lessee shall have the privilege of using, at an agreed price, dead and down wood from the nearby State Forest, which wood is to be used by him only for fire and fuel purposes, and to be procured by him only after permission has been given by an officer of the Department.

Whenever violations of the laws of the Commonwealth or of the rules of the Department relating to the use of the State Forests shall come to the notice of the lessee, he hereby agrees to give information of the same to the Department. The lessee likewise agrees to abide by all the rules now made for the government of the State Forests or which may be adopted in the future.

The lessee may make application for a renewal of this lease by filing with the Department an application in writing three (3) months prior to the expiration of the term for which it is granted; but the Department will exercise its discretion whether or not the lease shall be renewed; and if renewed, whether on the same or upon different terms; and if in the judgment of the Department it be deemed necessary or expedient that a renewal of the lease be refused, nothing herein contained shall be construed to limit the right of the Department so to do. No assignment of this lease, nor subletting of premises, shall be made by the lessee to any third person, except the same shall first be approved by the Department.

Should the lessee violate any of the conditions contained in this lease or any of the general laws of the Commonwealth or the rules of the Department for the government of the State Forest, the Department may upon proper proof thereof rescind and vacate this lease and require the lessee to remove at once from the leased land; and all buildings or other structures thereon erected by the lessee shall become the property of the Commonwealth if the lessee shall not within a reasonable time, to be fixed by the Department, remove the

same therefrom; but in every such case the Department will receive the application of the lessee or of third persons for the approval of an assignment of the lease to a third person for the remainder of the term and of the sale of any buildings on the leased area by the lessee to the intended assignee of the lease.

For the sake of the protection of the State Forest as well as for the protection of any buildings which may be erected upon the leased land the lessee is required to assist in the extinguishing of all forest fires which may originate within a reasonable distance of the leased land, and to use all reasonable means to discover where and how fire originated and report such discoveries to the Department, provided, however, that at the time of the fire the lessee be present occupying the leased premises.

The Department reserves the right to inspect the leased premises at all times, in order to determine whether this lease is being fully complied with.

The forester representing the Department on the reserve wherein the leased premises are situate, shall be supplied with a duplicate key to every cottage or other building erected on the leased land, as aforesaid, in order that in the absence of the lessee or his family and guests the premises may be inspected from time to time to see that they remain in good order and condition; and should the forester or any of his employees at any time be overtaken by storm or other cause making it necessary that they be afforded shelter while on that part of the reserve wherein the leased premises are situate, the privilege to use said cottage or other building erected thereon for such emergency purposes is reserved to the Department; it being understood and agreed that such use will be temporary and will be exercised only in case of emergency, and of which the forester shall be the sole judge.

Under the direction of the Department the lessee may at his own expense repair old roads or construct new ones to the site of the leased premises so as to make the locality more accessible. He may likewise at his own expense and under the same direction erect telephone lines to connect his cottage or other buildings with other lines in the neighborhood, and for this purpose the Department will furnish the necessary poles provided they may be conveniently had in the locality where the line is to be built; but the cutting, removal, and planting of the same and the stringing of the wires thereon must be done by the lessee and at his own expense. The Department shall have the use of all such telephones on the leased premises and without charge, except in case of a toll or a long distance call.

The hitching of horses to trees on the leased area is prohibited. For hitching purposes the lessee is requested to plant proper posts or otherwise provide for this need.

Under the direction of the Department it will be the duty of the lessee to clear the leased premises of decayed wood, briars, weeds, or other growth of worthless stuff, and of such trees as are not required for "nurse" trees, and to keep the premises in a condition to prevent, so far as possible, any spread of or invasion by fire.

The Department being desirous of promoting the use of the State Forests for general recreation and outing purposes, it will at all times be open to receive suggestions from the lessee with respect to such use of the lands, and will from time to time tender to the lessee and his family and guests such other assistance not herein specifically enumerated as will be proper for the Department to render, in order to promote the purposes for which the above recited Act of Assembly was enacted, as well as the comfort and convenience of the lessee.

Numerous applications have been received and acted upon by the Commission, and to December 31st, 1913, the following grants have been made:

Name and Address.	Location.	Annual Rental.
1. Joseph H. Williams, Wellsboro, Pa., ..	North Side of Bear Run, west side of Pine Creek, Shippen township, Tioga County,	\$4 00
2. George M. McDonald, Reynoldsville, Pa.,	Dark Hollow, near the head of Buck Hollow, Benezette township, Elk county,	5 00
3. C. A. Shunkwiler, Lewistown, Pa.,	Camp Conklin, Brown township, Mifflin County,	6 00
4. J. K. Sheerer, Mattawana, Pa.,	Old Hunters Cabin Site, Bratton township, Mifflin county,	5 00
5. E. E. Dippery, Reedsville, Pa.,	Bear Spring, Brown township, Mifflin county,	5 00
6. C. C. Schriver, Harrisburg, Pa.,	The Explorer's Cabin, Cooke township, Cumberland county,	15 00
7. Johnson Muthersbaugh, Lewistown, Pa.,	Kulp's Shanty, the Big Kettle, Jackson township, Huntingdon county,	8 00
8. H. Eyer Spyker, Lewisburg, Pa.,	Crabapple Camp, Miles township, Centre county,	8 00
9. J. W. Zindel, Galeton, Pa.,	The Big Spring, Stewardson township, Potter county,	5 00
10. H. T. Albee, Galeton, Pa.,	Brook's Spring, Stewardson township, Potter county,	5 00
11. F. L. Gilbert, Knoxville, Pa.,	Frazier's Crossing, Abbott township, Potter county,	3 00
12. John B. Boyer, Steelton, Pa.,	Bottom Field Log Cabin, Jackson township, Perry county,	5 00
13. Huston Township School District, Penfield, Pa.,	Laurel Run, Huston township, Clearfield county,	†
14. T. R. Quick, Galeton, Pa.,	The Three Springs, Abbott township, Potter county,	5 00
15. H. E. Leathers, Snow Shoe, Pa.,	Eddy Lick Run, Burnside township, Centre county,	5 00
16. F. C. Rice, Reedsville, Pa.,	Levensgood Spring, Brown township, Mifflin county,	5 00
17. L. G. Mayben, Milroy, Pa.,	Hassinger Mill Site, Jackson township, Huntingdon county,	5 00
18. J. W. Taylor,* Reedsville, Pa.,	Milliken Mill Site, Jackson township, Huntingdon county,	5 00
19. R. N. Witt, Asaph, Pa.,	Chimney Hollow, Shippen township, Tioga county,	5 00
20. R. N. Smith, Williamsport, Pa.,	Parker Camp, McHenry township, Lycoming county,	8 00
21. J. B. Swint, Reedsville, Pa.,	Chestnut Spring, Jackson township, Huntingdon county,	5 00
22. H. T. Reed, Reedsville, Pa.,	The Bear Spring, Brown township, Mifflin county,	5 00

Grants—Continued.

Name and Address.	Location.	Annual Rental.
23. E. H. Hershey, Pastor, The First Presbyterian Church, Wellsboro, Pa.	The Mouth of Darling Run, Shippen township, Tioga county,	1 00
24. H. W. Bailey, Wellsboro, Pa.,	The Edwards Clearing, Cummings township, Lycoming county,	6 00
25. L. S. Newton, Coudersport, Pa.,	Head of 12-Mile Run, Stewardson township, Potter county,	5 00
26. William Peters,† Milroy, Pa.,	The Tub Shanty, Brown township, Mifflin county,	6 00
27. B. E. Zerbey, Allensville, Pa.,	Martin's Gap, Miller township, Huntingdon county,	5 00
28. Otto J. Nestle, Reading, Pa.,	The Boiling Spring, Noyes township, Clinton county,	5 00
29. G. A. Woods, New Bethlehem, Pa.,	Munn's Mill, Benezetts township, Elk county,	5 00
30. C. D. Shaffer, Mifflinburg, Pa.,	The Halfway Place, Hartley township, Union county,	6 00
31. R. C. Houser, Milroy, Pa.,	Kulp's First Camp, Brown township, Mifflin county,	5 00
32. H. B. Shaver, Newton Hamilton, Pa., ..	The Old Climen Place, Wayne township, Mifflin county,	6 00
33. Samuel S. Eveland, 2324 Market St., Philadelphia, Pa.	Mud Pond, Porter township, Pike county,	6 00
36. F. A. Miller, Laurelton, Pa.,	The Sawdust Pile, Hartley township, Union county,	5 00
40. D. J. Eckman, Lancaster, Pa.,	Left Sugar Camp Road, Grugan township, Clinton county,	6 00
41. H. J. S. Weicksel,‡ Lock Haven, Pa., ..	Head of Ferney Run, Grugan township, Clinton county,	6 00
42. H. A. Stevenson, Lock Haven, Pa.,	Rattlesnake Run, Grugan township, Clinton county,	6 00
44. Ray P. Fleming, Reedsville, Pa.,	Coulter's Cabin, Union township, Mifflin county,	5 00
46. W. H. Toner, Lewistown, Pa.,	Stone Creek Bridge, Jackson township, Huntingdon county,	7 00
53. Warren Fisher,‡ Renovo, Pa.,	Second Fork of Yost Run, Beech Creek township, Clinton county,	5 00
71. J. J. Barner, Loganton, Pa.,	McCall's Dam, Miles township, Centre county,	5 00
72. Thos. H. Clapham, Mifflinburg, Pa.,	Black Gap, Miles township, Centre county,	5 00
102. A. Ward Wilson,‡ Altoona, Pa.,	Lyman Gap Spring, White Deer township, Union county,	5 00
103. W. C. Krader, Coburn, Pa.,	Prices Spring, Haines township, Centre county,	3 00

*Withdrawn January 26, 1914.

†No charge.

‡Leases granted and drawn but not yet executed.

Leases awarded before December 31, 1913, but not drawn for execution on that date:

E. H. Ashcraft, Coudersport, Pa.,	Site three-fourths of a mile above Abbott Station, Potter county.
Geo. F. Bailey, Jersey Shore, Pa.,	
Dr. C. J. Hunt, Harrisburg, Pa.,	Site at Laurel, Cooke township, Cumberland county.

Numerous applications are still on file to be acted upon by the Forestry Commission as examinations and reports upon the tracts desired may be made.

The temporary camping feature is a use of the State Forests which is continuing to be as popular as formerly. During the year 1912 permits were issued to 4,672 individuals, and during 1913 to 4,521 individuals.

The following table shows the growth of the temporary camping idea since the issuance of permits was first begun in 1904:

Year.	Number of permits issued.	Number of persons to whom permits were issued.
1904,	213	1,614
1905,	379	1,977
1906,	421	2,303
1907,	442	2,497
1908,	596	3,409
1909,	622	3,597
1910,	623	3,556
1911,	749	4,528
1912,	711	4,672
1913,	811	4,521

OUTING AND RECREATION.

The Department of Forestry has always taken a lively interest in the use of the State Forests for purposes of pleasure and recreation. It has consistently invited the people to avail themselves of these privileges and for this use has thrown the least possible restriction about these lands. The few simple rules which have been adopted for the use of the State Forests by third persons are only such as would be observed at any time by any individual possessing a due sense of propriety.

In order, therefore, to emphasize the duties of the Commission and to spread broadcast among the people of the State the knowledge that an invitation is tendered them at any time to enjoy the State Forests, the following resolution was adopted by the Commission at its regular meeting held October 3, 1913:

WHEREAS, This Commission has consistently advocated the use of the Pennsylvania State Forests as outing and recreation grounds for the people, to be freely used, subject only to the few reasonable rules necessary for the protection of the land itself; and

WHEREAS, The joy of child life, the conservation of youthful health, and education for future good citizenship will be augmented by intelligent use and enjoyment of the State's great outing grounds; therefore

BE IT RESOLVED that the State Forestry Reservation Commission grant to the children of Pennsylvania free use of the State Forests as recreation ground, subject to the few reasonable and necessary rules for the protection of the land itself, and urges upon them the

use of this land for all proper purposes, particularly for mineral and plant study, the collection of wild flowers, the study of bird and animal life, the gathering of chestnuts and other wild nuts and fruits, and the enjoyment of such pleasures as are incident to the life of a child in nature's great out-of-doors.

RESOLVED, further, that all forest officers afford every reasonable facility in their power to the children in their respective neighborhoods, for the enjoyment of the privileges herein conferred, and of which the children are freely invited to avail themselves.

GEORGE W. CHILDS PARK.

During his lifetime Mr. George W. Childs, the well known editor and proprietor of the Philadelphia "Public Ledger," acquired and set aside for park purposes in Delaware township, Pike county, a tract of land containing 52 acres, 88 perches. This little tract of land is famous throughout all the neighborhood for its natural beauty. It possesses an extremely good character of woods, a stream of water passing entirely through it, broken at several places by waterfalls and cascades. The sides of the stream and the tract generally are stocked with rhododendron and mountain laurel. It contains a number of attractive cleared areas, where picnic parties find much pleasure in taking outings. The whole is indeed a little gem set in the side of the hill, and in which Mr. Childs during his lifetime took much pleasure.

By his will, Mr. Childs devised his estate to his wife, Emma B. Childs, stating he has "full confidence that she, knowing his plans and purposes, would by gift during her life make such disposition thereof for charitable or other uses as would be in accordance with his wishes." In fulfillment thereof, Mrs. Childs, well knowing the desires and wishes of her husband, proposed to give Childs Park to the Commonwealth of Pennsylvania through the Forestry Department, to be added to the holdings of the Department and to be devoted "for the use of the people of the Commonwealth of Pennsylvania as a park or public recreation ground, under and subject to the condition that the said grantee shall maintain the premises hereby granted as a park or public recreation ground, and shall at no time permit any person to shoot fire arms or hunt upon same premises, and that the said premises shall hereafter be named 'George W. Childs Park'."

The deed of conveyance makes a reservation of 108 perches, the area of a small burial ground within the park, so that the total area conveyed to the Commonwealth amounts to 51 acres, 140 perches, which was received in accordance with the provisions of the will and of the deed of conveyance, and will be held by the Department to and for the use of the people of the Commonwealth of Pennsylvania as a park or public recreation ground.

Fully appreciating the courtesy of Mrs. Childs and believing that her act in placing within the possession of the Commonwealth such a beautiful and attractive bit of natural scenery as there is in this park should receive public and official recognition, the State Forestry Reservation Commission at its meeting held June 6, 1912, adopted the following resolution, proposed by Miss Mira L. Dock and seconded by Dr. J. T. Rothrock:

"RESOLVED, by the State Forestry Reservation Commission that the thanks of the Commission and of the Pennsylvania Department of Forestry be tendered to Mrs. Emma B. Childs for her public spirited action in conveying to the Commonwealth without consideration an area of land containing 51 acres, 140 perches, located in Pike county, Pennsylvania, and known as the George W. Childs Park, to be held and maintained by the Department of Forestry as a park to which the public is invited and over which the State will exercise due and careful supervision.

"RESOLVED further that the patriotic action of Mrs. Childs may well be emulated by other Pennsylvanians who may be in possession of favored areas containing picturesque, notable physical, or other features, which ought to be preserved inviolate and which might well be committed to the care and oversight of the State, to be maintained for the benefit of the people as recreation centres and places for outdoor enjoyment."

The sentiment in the above resolution with respect to committing to the custody of the Commonwealth to be preserved in the manner indicated, such similar small areas for parks and recreation grounds, is thus brought prominently to the attention of our people; and no Pennsylvanian can build for himself a better monument than by thus setting aside for the future enjoyment of the people similar areas having attractive natural features which are likely to be despoiled if they remain in private hands and are not committed to the care and oversight of the State; for here they will be maintained in accordance with the terms of the grant for all time to come.

The date of the deed from Mrs. Childs to the Commonwealth is May 22, 1912. It conveys the above tract for the consideration of one dollar, and is recorded in Pike county in Deed Book 66, page 158.

MISS MIRA LLOYD DOCK.

At the close of the year 1913 but one of the first members of the State Forestry Reservation Commission remained, Dr. J. T. Rothrock. Two such members were of the Commission until the expiration, on July 25, 1913, of the term of Miss Mira L. Dock, who declined a re-appointment which was tendered her, because of other duties, although urged to do so by the friends of forestry throughout the State. The retirement of Miss Dock, therefore, removed from the Commission one of its most useful and interested members, who was regular in attendance at the meetings, took a deep concern in all the work of the Department, and always was ready to sacrifice her private interests for the public good. Miss Dock retires with the best wishes of all her associates, and very much to the regret of the members of the Federation of Women's Clubs, whom she served for many years as Chairman of their Committee on Forestry. It was through her influence and kindly interest that the members of the Women's Clubs of Pennsylvania have taken such a deep and lasting hold of our forestry problem, and from whom this Department has received most efficient aid and encouragement.

On the resignation of Mr. Albert Lewis, an original member of the Commission, on July 11, 1901, Miss Dock was duly appointed to serve in his place, her commission bearing date July 25, 1901. She served in this capacity for three successive terms, having been reappointed by Governor Pennypacker in 1905 and by Governor Stuart in 1909.

As a fitting mark of regard and in order that there might be placed among the records of the Forestry Reservation Commission a minute respecting her severance of relations with Pennsylvania forestry work, the Commission did accordingly, at its regular meeting held on the third day of October, 1913, adopt the following resolution:

"WHEREAS, Miss Mira Lloyd Dock, our honored associate in the Forestry work of the State, after 12 years of faithful, productive effort, has felt obliged to decline longer service; therefore be it

"RESOLVED, That Miss Dock's withdrawal from the State Forestry Reservation Commission is a cause of great regret to the members of the Commission who have been so long and so closely associated with her.

"RESOLVED, That we seriously feel her absence. Her voice was always for earnest, wise work. With a woman's instinct she saw the need of measures which escaped notice of other members of the Commission, and with a woman's tact she led to their adoption.

"RESOLVED, That we recognize that the present advanced position of Pennsylvania in Forestry matters is largely due to the interest and assistance of the women of the State, and that we have always regarded Miss Dock as their representative, believing that her place in our meetings cannot well be taken by any other person. She constituted a class of which she was the sole member.

"RESOLVED, That we hope many years of health, happiness, and useful effort may yet be accorded her. We will each and every one always be proud to remember that she was our associate.

"RESOLVED, That an engrossed copy of these resolutions be transmitted to Miss Dock."

In accordance with the last paragraph of the resolution, a suitably engrossed copy thereof has been prepared and forwarded to Miss Dock, as expressive of the regard in which all her former associates held her during an uninterrupted service of twelve years freely given at a large personal sacrifice for the good of the Commonwealth.

LEGAL AFFAIRS.

The Department is again able to report that during this period there was little occasion to invoke the aid of the criminal law. It is the purpose of the Department to prosecute all cases of setting fire on State land where sufficient evidence may be had, but among all the instances of such fires it is the opinion of the Commissioner that no such evidence was in hand, and accordingly no prosecutions were undertaken. We accept the theory that prosecution does not promote any real good unless it is reasonably possible to secure a conviction.

Two cases of trespass on State lands were brought to the attention of the Department, and settlements were made without prosecution, the defendants agreeing to pay the damage they wrought and the Department to receive such settlement in lieu of legal action.

The first case of this kind was reported by Forest Ranger E. T. Riviere, who detected the illegal taking of timber from the Westfall division of the Minisink State Forest. The defendants, Harry Pitney, Louis de Berlhe, and Everett Lieight, paid \$18.00 in settlement, and this amount was paid into the Treasury March 12, 1913.

The second was a case reported by Forester N. R. McNaughton of the Karthaus Division of the Clearfield State Forest, where Q. E. Beauseigneur made settlement for timber taken from State land.

The defendant in this case undoubtedly acted mistakenly and not intentionally, and the Department accepted a settlement for the value of the timber taken, to wit, \$57.17, which amount was paid into the Treasury October 31, 1913.

A case of violation of the rules of the Department was reported by Forester H. C. Evans against one Veris Burkholder for erecting a camp on State lands and building a fire without permit, as required. This case was handled by W. H. Spencer, Esq., of Williamsport. The defendant was arrested, brought before court, where he admitted the offence and a fine of \$25.00 and costs was imposed by Judge Whitehead, the amount of the fine being subsequently paid and deposited in the Treasury by this office August 1, 1913. Burkholder's companion in this escapade was one C. E. Creighbaum, who left the neighborhood immediately and could not be apprehended.

Henry Karschner of near Lock Haven, Clinton county, paid \$3.00 for timber cut on State lands. Fry & Persun, through forest ranger Mull, \$3.10 for railroad ties cut on State land. Both of these cuttings were in the nature of unintentional trespass. Amounts indicated have been deposited with the State Treasurer.

During the season of 1913 spring fires, Fire Warden James Tenley of Defiance, Bedford county, summoned one James Williams to help extinguish fire. Under the act of Assembly creating a system of fire wardens, a person may not refuse to respond to such summons unless he has a legal excuse. The defendant offered no such excuse and questioned the power of the fire warden to compel him to attend. He was accordingly placed under arrest by the fire warden for failure to comply with his summons and after a trial in the Quarter Sessions court at Bedford, was convicted for violation of the law and sentenced to pay the costs, amounting in the aggregate to about \$60.00. The effect of this conviction has been good. There has been much indifference in Bedford county respecting the extinguishment of forest fires, and it is hoped that the lesson thus impressed will not be lost upon others who are too indifferent to the damage wrought by such fires to lend assistance when summoned.

A controversy arose with William Bilger respecting the ownership of a small tract of land located in Lack township, Juniata county, Mr. Bilger claiming to own a small area which was surveyed into the purchase from Hedwig A. Oppel. The area in dispute was but a few acres and the determination of it one way or the other involved the permanent location of the State's boundary line. Mr. Bilger's claim was based upon a survey made for him at a time prior to the State's purchase. To have tried out this title in court and won would have meant an expense of many times the value of the land in controversy. A proposition of amicable adjustment was therefore made involving the division of the disputed tract, which after a con-

ference with Mr. Bilger and his counsel at Mifflintown on November 26, 1912, was finally agreed to. A new survey line was accurately run upon the ground and the boundary line relocated in accordance with the new survey, each party taking about five acres of the disputed tract.

A claim was made on the Adams Express Company for the breakage of a painted sign, a part of the exhibition material which was used at Philadelphia. The claim was settled by the company paying the sum of \$5.00, which amount was deposited with the State Treasurer.

There are at present pending two suits in trespass, one against H. V. Wilhelm in the Clinton county court, and another against J. W. Lauver in the Mifflin county court. Since neither of these has been terminated, no further report may be made at this time.

DEPARTMENT LEASES.

The Federal Refractories Company.

During the years covered by this report, the Department was in receipt of steady returns from the first lease executed to the Federal Refractories Company. A statement of the revenues for the two years respectively is as follows:

Revenues for 1912.

January,	1335-75/112	tons at 5½c per ton,	\$73 46
February,	1221-109/224	" " "	67 18
March,	582-45/56	" " "	32 05
April,	1436-201/224	" " "	79 03
May,	1480-169/224	" " "	81 44
June,	1574-1/16	" " "	86 57
July,	1807-3/4	" " "	99 43
August,	2105-25/225	" " "	115 78
September,	1635	" " "	89 93
October,	2260-55/224	" " "	124 31
November,	2175-5/56	" " "	119 63
December,	2022-31/112	" " "	111 23
Total,			\$1,080 04

Revenues for 1913.

January,	1741-43/112	tons at 5½c per ton,	\$95 78
February,	1450-179/448	" " "	79 77
March,	1397-3/224	" " "	76 84
April,	1541-71/112	" " "	84 79
May,	1429-19/224	" " "	78 60
June,	1517-217/224	" " "	83 49
July,	1327-751/1120	" " "	73 02
August,	1437-61/112	" " "	79 06
September,	1468-69/112	" " "	80 77
October,	1218-143/224	" " "	67 02
November,	982-161/224	" " "	54 05
December,	928-31/112	" " "	51 06

Total, \$904 25

Total for two years, \$1,984 29

The value to the Commonwealth of this lease is shown as of December 31st, 1913, by the following statement of account:

To purchase price of land, 1,087 acres, 69	
perches at \$2.75 per acre,	\$2,990 44
Interest on the purchase price to date above, ..	713 37
Fixed charges for road and school purposes to	
above date,	435 25

Total, \$4,139 06

Royalties received, previously reported,	\$6,398 39
Royalties received during the years 1912-13,	1,984 29

Total, \$8,382 68

Total receipts to above date,	\$8,382 68
Total expenditures and charges to above date,	4,139 06

Excess of receipts over expenditures, \$4,243 62

The above statement shows that the Commonwealth has received from the above lease an excess of \$4,243.62 over all its expenditures, which is equivalent to a return of 202.52 per cent. on the investment as of December 31, 1913.

THE FEDERAL REFRACTORIES COMPANY LEASE NO. 2.

A lease to the above company dated December 22, 1909, for 3,542 acres located in the townships of Logan and West, Huntington county, for the sale of rock on the above tract, is similar in all respects to that contained in the foregoing lease. The lessee has not yet been able to begin the removal of rock. By action of the State Forestry Reservation Commission the time for beginning such removal has been extended to the 15th day of June, 1915.

THE SOUTH RENOVO WATER LEASE.

This lease bears date August 28, 1906, and is to run for a period of twenty years. For the year 1912 the borough reports the use of water as follows:

208 houses at 25 cents per house,	\$52 00
10 dwellings outside of the borough using 539,627 gallons at 1 cent per thousand,	5 40
	<hr/>
Total,	\$57 40

The charge for the use of water within the borough was remitted by the Department, leaving a balance due the Commonwealth under the lease of \$5.40, which amount was received and paid into the State Treasury.

Report for the year 1913.

244 houses at 25 cents per house,	\$61 00
Water used outside of the borough amounting to 403,217 gallons at 1 cent per thousand,	4 03
	<hr/>
	\$65 03

By action of the Forestry Commission, charges to the extent of \$49.89, for water used within the borough, were remitted, leaving a balance due of \$15.14, which amount has been received and paid into the State Treasury.

THE CHAMBERSBURG WATER LEASE.

This lease, which is dated November 7, 1910, began to yield returns when the water was turned on on July 3, 1911. At the time of the preparation of the last report, covering the years 1910-11, no report had been received from the borough respecting the use for the fraction of the year. A statement, therefore, of the revenue derived from this lease from July 1, 1911 to December 31, 1913, is as follows :

Revenue derived from flat water rents, 1911,	\$11,774 40
Revenue derived from metered water rents, 1911,	6,291 07
Electric light plant, free water, value estimated at,	200 00
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Total revenue for the year 1911 upon which the charge under the lease is to be calculated,	\$18,265 47
Rated on a six months' basis,	9,132 73
Charge at the rate of one-half of 1%,	45 66

Statement for 1912.

Revenue derived from flat water rents,	\$11,444 78
Revenue derived from metered water rents, ..	10,526 56
Revenue derived from delinquent water rents, calculated on a six months' basis as per charge for that year,	678 80
Revenue derived for water for building purposes,	34 91
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Total revenue for 1912 upon which charge is to be calculated,	\$22,685 05
Charge at the rate of one-half of 1%,	113 43

Statement for 1913.

Revenue derived from flat water rents,	\$12,189 78
Revenue derived from metered water rents, ..	13,493 16
Revenue derived from delinquent water rents, 1911 and 1912,	1,624 16
Water for building purposes,	108 67
Special permits, 1911,	57 95
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Total revenue for 1913 upon which charge is to be calculated.	\$27,473 72
Charge at the rate of one-half of 1%,	137 37
Total receipts to December 31, 1913, from above lease,	\$296 46

THE THOMAS CRONIN COMPANY.

A lease bearing date March 25, 1912, after due compliance with the legal formalities as required by act of February 25, 1901, P. L. page 11, was awarded to the Thomas Cronin Company of Pittsburgh, a Pennsylvania corporation, for the sale and removal of blue stone from a quarry within the Stuart State Forest near Ligonier, Westmoreland county, on the line of the Pittsburgh, Westmoreland, and Somerset Railway Co. The lessee is required to exercise due care in operating the quarry, destroy no standing timber except that which is unavoidable in the process of quarrying, and pay for that which is destroyed. The royalty paid by the lessee is 16 cents per ton of 2240 pounds. Bond in the sum of \$2,000 is filed by the lessee and he is required to remove a minimum gross weight of 6,000 tons per year or pay for that amount if not removed. The leased tract is limited by the agreement to 300 feet in depth by 500 feet in length, measured on a level with the tracks of the railroad. This amounts to an area of 3.44 acres, for which the Commonwealth paid \$17.20.

By affidavit dated June 17, 1912, it is shown that the first removal of blue stone from said quarry was made on June 11, 1912. The revenue, therefore, accrues from that date with the first material removed.

A statement of revenue derived from the above lease is as follows:

Revenue for 1912.

June,	460.67 tons at 16c per ton,	\$73 71
July,	383.08 " " "	61 29
August,	439.5 " " "	70 32
September,	194 " " "	31 04
October,	445.05 " " "	71 21
November,	684.77 " " "	109 56
December,	505.27 " " "	80 84

Revenue for 1913.

January,	326.07 tons at 16c per ton,	\$52 17
February,	277.6 " " "	44 41
March,	374.1 " " "	59 85
April,	739.42 " " "	118 31
May,	455.44 " " "	72 87
June,	528.61 " " "	84 58
July,	484.82 " " "	77 57
August,	590.35 " " "	94 45
September,	228.88 " " "	36 62
October,	405.18 " " "	64 83
November,	112.81 " " "	18 05
December,	255.49 " " "	40 88

Total for 19 months, \$1,262 56

It will be seen from the above statement that this lease is one of advantage to the Commonwealth and in a reasonable time will pay a very substantial rate of interest on the investment. The Stuart State Forest, located in Westmoreland and Somerset counties, contains an aggregate of 8,532 acres, for which the Commonwealth paid \$5.00 per acre, or a total of..... \$42,662 81

Interest on this amount at 2% from date of purchase to December 31, 1913,	4,266 28
Fixed charges thereon from the date of purchase to December 31, 1913,	1,535 76
Salaries of foresters and rangers to above date, including amount expended for labor, incidental expenses and surveys,	11,406 42

Total cost of the Stuart State Forest, \$59,871 27

Revenue derived from the above lease for a period of 19 months, \$1,262 56
 Showing to date a net return on the total investment of 2.18 per cent.

The above lease has 13 years and 5 months to run.

THE SANDUSKY PORTLAND CEMENT COMPANY.

With the final purchase of the lands in Cumberland county at Pine Grove Furnace from the South Mountain Mining and Iron Company, which was consummated by deed bearing date the 12th day of September, 1913, there were conveyed to the Commonwealth two existing leases appurtenant thereto which had formerly been entered into with the lessees by the grantor, and which upon final transfer of the title to the Commonwealth were assigned to the State of Pennsylvania. In one of these the lessee is the Sandusky Portland Cement Co. with offices located in York, Pa., and in Sandusky, Ohio. This lease is dated August 1, 1912. The assignment was made to the Commonwealth under date of December 3, 1913. It grants the lessee the right to search for, remove, and use all clay found in a radius of one-fourth of a mile of the then present mouth of a certain clay shaft in the mountainside back of Gardner's farm. The term of the lease is ten years from June 1, 1912, or so long as a suitable supply of clay may be obtained, but not to exceed the ten-year limit.

The royalty to be paid for the clay is 25 cents per ton of 2,000 pounds, railroad weight, payable monthly. A minimum royalty of \$600.00 per year is reserved by the lease.

During the month of December, 1913, this company removed from the State land 521.906 tons of clay, which at the royalty of 25 cents per ton, has yielded to the end of the period covered by this report \$130.48.

THE UNITED ICE AND COAL COMPANY.

The second of the leases acquired by the Commonwealth with the purchase of the lands of the South Mountain Mining and Iron Company, is one dated December 30, 1898, originally made to John S. Low, et al., trading as The John S. Low Ice Co. Prior to the acquisition of the lease by the Commonwealth, the rights of the lessee were acquired by the United Ice and Coal Co., a Pennsylvania corporation, and the original lease with all rights thereunder duly assigned, as aforesaid, was by assignment of lease, under date December 3, 1913, conveyed to the Commonwealth of Pennsylvania.

At a point called Laurel within the State Forest, in the main valley stream, Mountain Creek, a dam has been constructed making a lake of considerable extent for the purpose of harvesting ice. Here the United Ice and Coal Co. has erected storage houses and a siding from the Hunters Run and Slate Belt railroad for the purpose of removing and marketing ice. The above lease carries the privilege to enter upon the premises and remove such ice as may be of commercial value during the proper season. Upon the acquisition of the lease by the Commonwealth as owner, a modification and extension of the same was accomplished by agreement tentatively adopted during the latter part of 1913, but not executed until January, 1914. For this reason no royalty accrued to the Commonwealth during the year 1913, but will appear in later reports.

The present subsisting agreement between the parties provides that the lessee shall keep the whole dam in repair and to place within the storage house on the premises at least 5,000 tons of ice each year. Should there be an excess of ice above this quantity, the lessee may permit other persons to remove ice and may, during the freezing period, remove in cars such excess for storage elsewhere. The lessee agrees to pay to the Commonwealth a royalty of 5 cents per ton of 2,000 pounds for all ice originating upon and shipped away from the leased area, railroad weight to be taken, and the same to be reported by affidavit each month; also to pay a similar royalty on all ice which it may sell to third persons for the purpose of re-sale. Royalty shall be paid upon a minimum annual amount of 5,000 tons, whether ice to that quantity be shipped or not. The ice year is therein defined as extending from the first day of May in each year to and including April 30th of the succeeding year.

GEOLOGICAL AND TOPOGRAPHICAL REPORTS ON STATE FORESTS.

From time to time foresters in charge have made geological studies and topographical reports of their areas. These have been published in greater or less detail and are found scattered through the reports of the Department. It is probably desirable to index them for future reference. The following reports have thus far been submitted. The book and page of the Department report is appended for ready reference:

Forest.	Division.	Forester Reporting.	Year of report.	Page.
Bedford,		Byers,	1907	89
Trough Creek,		Heintzleman,	1907	80-83
Stone,	Asaph,	Mulford,	1907	102
Stone,	Asaph,	Mulford,	1908	312
Seven Mountain,	Kishacoquillas,	McNeal,	1907	84
Seven Mountain,	Kishacoquillas,	McNeal,	1908	119
Minisink,	Notch,	Avery,	1908	157
South Mountain,	Cumberland,	Haupt,	1908	279
Pennypacker,		Bryner,	1908	201
South Mountain,	Caledonia,	Conklin, R. G.,	1908	162
Seven Mountain,	Jacks Mountain,	Conklin, W. G.,	1908	210
Clearfield,	Clearfield,	Dague,	1908	138
Sinnemahoning,		Elliott,	1908	266
Kettle Creek,	Crossfork,	Emerick,	1908	307
Black Forest,	Waterville,	Evans, H. C.,	1908	195
Sinnemahoning,	Austin,	Fox,	1908	300
McElhattan,		Dutlinger,	1908	147
Black Forest,	Blackwells,	Retan,	1908	332
Clearfield,	Penfield,	Kirk,	1908	275
Seven Mountain,	Bear Meadows,	Ludwig,	1908	253
Stuart,		Williams,	1908	343
Seven Mountain,	Barree,	Morton,	1908	189
Buchanan,		Witherow,	1908	179
Whetham,		Dutlinger,	1908	147
Minisink,	Pocono,	Strobeck,	1908	298
Loyalsock,		Bastian,	1910	63
Seven Mountain,	Greenwood,	Kraft,	1910	54
Rothrock,		Badine,	1910	65
Hopkins,	Reno,	Thomson,	1910	56
Clearfield,	Karthaus,	McNaughton,	1910	67
White Deer,	Tea Spring,	Metzger,	1910	67
Grays Run,		Wells,	1910	68
White Deer,	McCall,	Winter,	1910	55
McClure,		Witherow,	1910	69
Sinnemahoning,	Sizerville,	Evans, W. B.,	1913	.....
McElhattan,		Hagentogler,	1913	.....
Trough Creek,		Haupt,	1913	.....
Seven Mountain,	Coburn,	Meek,	1913	.....
Stone,	Chatham,	Miner,	1913	.....
Kettle Creek,	Leidy,	Muller,	1913	.....
Young Womans Creek,		Mumma,	1913	.....
Whetham,		Ryon,	1913	.....
Hopkins,	Snow Shoe,	Sheeler,	1912	.....
Bald Eagle,		Smith,	1913	.....
Grays Run,		Wells,	1912	.....
McClure,		Witherow,	1913	.....
Sinnemahoning,	Medix,	Zerby,	1913	.....

THE DYNAMITE EXPERIMENT.

In 1911 the Department of Forestry entered into an agreement with the Dupont Powder Company to experiment with subsoil blasting to determine what acceleration of tree growth might be produced by loosening the hardpan within State forest plantings. To this end six 1-acre tracts were selected located respectively at Mont Alto, Franklin county; Fields Station, Lycoming county; Ansonia, Tioga county; Glen Union, Clinton county; Laurel Summit, Westmoreland county; and Notch, Pike county. Each experimental plot consists of one dynamited acre planted to seedling trees, and immediately beside it another check acre is laid off planted with the same kind of trees. The growth of trees has been small at the outset, as is usually the growth with young forest trees shortly after planting. Nothing in the way of set measurements can yet be made, but it is hoped that after the growth of the year 1914 is had, when the trees will have had three years' growth from planting, there will be sufficient data to make a report and a reasonable comparison. Nothing, therefore, is to be said about the results of the experiment until such studies may be made at the end of the growing season in 1914.

CHESTNUT BLIGHT.

The fungus disease commonly called the Chestnut Blight which made its appearance within the State a number of years ago and which was the cause of the creation of the Chestnut Blight Commission to study the problem and attempt to eradicate the disease, is still common within the State, and so far as can be learned, is ravaging the chestnut stock about the same as formerly. In the eastern and southern portions of the State thousands of chestnut trees have died and the disease seems to be progressing gradually westward.

Because of the failure of the Legislature to appropriate a sum of money which in the judgment of the Commission was deemed adequate to carry on its work, the Commission declined to accept the appro-

priation of \$100,000 and requested the Governor to veto the appropriation, which was accordingly done. The life of the Commission and its former appropriation extended beyond the end of the fiscal year June 1, 1913, and the Commission consequently carried on its work until some time in the autumn of that year.

The Department was in active collaboration with the Commission in all its work during the period of activity. This, of course, ceased with the closing of the work of the Commission.

DEPARTMENT EDUCATIONAL EFFORTS.

The Department was requested to prepare and install an exhibit for a second time with the Western Pennsylvania Exposition Society in Pittsburgh. In compliance therewith, the exhibit was put into place in September, 1913, and maintained there for a period of nearly two months, for study and inspection by the public. Many hundreds of persons visited the exhibit during its continuance, and much interest was manifested, particularly by the school children and young people.

The exhibit was in charge of Forester James E. McNeal, and Forester Maurice Mustin. The display undoubtedly was of value and the installation of similar displays in other parts of the State would be of benefit.

The same exhibit had previously been installed in the fall of 1912 at the annual exhibition and farmers' encampment which is held at Grange Park, Centre Hall, in Centre county. Here it was received with favor. All visitors were interested and many questions were asked respecting its purpose and meaning. This exhibit at this place was in charge of Forest Inspector George H. Wirt and foresters John W. Seltzer, Charles R. Meek, and Harry J. Mueller, and was maintained for a period of one week.

In May, 1913, the Pennsylvania Forestry Association held a series of meetings and installed a variety of exhibits in Horticultural Hall, Philadelphia. The exhibit of this Department was placed there in charge of Forest Inspector George H. Wirt, Foresters James E. McNeal, W. Gard. Conklin, and Maurice Mustin. At the auditorium meetings which were held in the afternoon and evening, addresses were made by members of the Department as follows:

Dr. J. T. Rothrock, Member of the Commission. Subject: "Desolate Pennsylvania."

Hon. S. B. Elliott, Member of the Commission. Subject: "Forestry and the Lumber Industry."

I. C. Williams, Deputy Commissioner of Forestry. Subject: "Diseases of our Forest Trees with Special Reference to the Chestnut Blight."

This effort of the Pennsylvania Forestry Association was notable in many ways. It was visited by hundreds of persons, was most favorably noticed in all the newspapers, and aroused much interest and comment.

All the foresters connected with the Department are under instruction to take as large a part as possible in the educational efforts of their communities. They are advised to visit schools and make addresses to the children on arbor days, and at such other convenient times as may be desirable, to take parties for an outing into the woods, teach them about the work that is being done within the State Forest, show how to plant trees, explain the danger of forest fire, and generally fill the minds of the young with a greater desire to know more about the usefulness of the woods.

The forest community idea which was discussed in the previous report of this Department, is being worked out in two notable instances within the State Forest, to-wit, by Forester R. Lynn Emerick at Crossfork, Potter county, and by Forester John R. Williams at Pine Grove Furnace, Cumberland county. These two regions are so isolated and cut away from the outside world that the finest opportunity exists in both cases for the working out of the idea mentioned in the former article.

In addition to all the above, the Forest Inspector George H. Wirt, made numerous addresses to associations and clubs, more fully reported upon in his individual report contained herein. The Deputy Commissioner of Forestry also had numerous calls throughout the State for lectures and addresses and responded wherever it was possible to do so. Miss Dock, Mr. Elliott, and Dr. Rothrock of the Commission were likewise in demand, and wherever it was possible for them to be present and discuss the forestry problems, they willingly gave their time to the work.

A report in detail on the last Pittsburgh exhibit made by the foresters in charge, Messrs. McNeal and Mustin, follows:

**“EXHIBIT OF PENNSYLVANIA DEPARTMENT OF FORESTRY
AT THE
PITTSBURGH EXPOSITION.**

—
August 27th to October 18th, 1913.
—

“The exhibit arrived in Pittsburgh and the work of setting it up was begun on August 22nd. This required the work of three men, who were familiar with the material to be displayed, until the day of opening, August 27th.

“The Exhibit was located on the north side of Machinery Hall on a 60 ft. x 28 ft. floor space, between the exhibit of the Pittsburgh Department of Public Works and Heckler's Stove Exhibit.

“Our location was disadvantageous, first, because the Pittsburgh Department of Public Works exhibit was almost entirely enclosed by a wall 10 ft. high, and, being nearer to the Hall entrance, hid our exhibit from the view of those entering. Secondly, most of the people entering walked only in the center aisle. Third, many people came to the Exposition principally to hear the music and never entered the hall in which our exhibit was located. Fourth, the roof was in bad condition and on rainy days the water came through. On several occasions it was necessary to close the exhibit until damage could be repaired.

“It is suggested that thorough protection from damage by fire and water and absolute safety of all articles displayed, be guaranteed by those desiring the exhibit in the future. It is further suggested that in the event of a future request by the Exposition Society of Western Pennsylvania for a Department exhibit, it be sent only on condition that floor space in the main hall be granted.

“The Exposition was open to the public from 10 A. M. to 10.30 P. M. every day except Sunday.

“The exhibit was attractive to most of the people who saw it, and there is no doubt that its installation was well worth while. It was frequently visited by those interested in educational work, who asked questions concerning the work of the Department, and means of securing material such as lantern slides, specimens of wood, leaves, seeds, etc., for educational purposes. Thousands of grade, high, and normal school pupils from the city and county were amply supplied with literature, and were very much interested in the exhibit. Besides these, there were farmers and other people interested in shade trees who asked specific questions concerning tree diseases, planting, desirability of various species of trees for shade and other purposes. The Boy Scouts were interested in conservation in general, and in nature studies, and asked for literature for their quarters.

“The Assistant City Forester of Pittsburgh, the Borough Forester of Sewickley, and several other foresters doing private work, frequently visited the exhibit and were keenly interested in the work and complimentary in their comments.

"Many people visited the exhibit who seemed simply curious or did not ask questions because they did not feel that they could ask intelligent ones. The exhibit did not appear to make the desired impression upon these people, either because of lack of interest on their part or insufficiency of the exhibit, or both.

"Following is a discussion in detail and suggestions for the improvement of the exhibit. Each object or group of objects will be discussed as to its attractiveness, and suggestions made for betterment. This will be followed by several general suggestions which past experience seems to advise or indicate, the object being to increase the efficiency and decrease the cost of transportation and handling of material.

"*Insects.* Four cases of injurious and beneficial insects were loaned by the Zoological Division of the Pennsylvania Department of Agriculture. They attracted as much, if not more, attention than anything else here. They were, however, looked upon not as a number of different types of beneficial or injurious insects, as was their purpose, but as a collection of 'bugs' of varied color and size. The remark 'funny bugs with pins stuck in them' was frequently heard. It was evident that the collection had failed, to a great extent, in its object. Lack of proper arrangement and insufficient labels and description cards are probably the cause of the failure. It is suggested that a number of the most important insects, injurious and beneficial to shade and forest trees, be placed in Riker mounts. They should be placed in such a way that the life history of each insect will be shown, together with the work of the insect. Labels should be carefully placed giving, briefly, the economic importance, and if injurious, the best remedy, the time to apply the remedy, or any other data of importance.

"*Fungi.* The exhibit of fungus specimens was insufficient in that only the fruiting bodies and not the diseases caused by the fungi were shown. If the fruiting body together with the diseased part of the tree, properly and conspicuously labeled, giving importance and extent of disease, preventives, remedies, etc., were shown, the object of the display would be self-explanatory, and the desired results would be attained. Then too, specimens of treated timber might be added explaining methods and preservatives used. Two posts, one treated and one untreated, which have been in the ground for the same length of time, and similarly two sections of railroad ties, should prove an addition of worth.

"*Logs.* The twenty-eight logs were very attractive, but on account of their size and weight it is suggested that a number of comparatively small pieces showing cuts and bark be prepared as shown in Plan 1. This would answer the purpose and cut down the expense of transportation and handling. Permanent labels should be placed with each species. The specimens may be grouped into 'Commercial Woods of Pennsylvania' giving principal uses, 'Weed Trees of Pennsylvania,' etc.

"*Leaf Mounts.* The leaf mounts made by Mrs. Royd Rothrock are a very valuable part of the exhibit. They attracted considerable attention and many inquiries as to the means of obtaining similar exhibits for educational purposes, were made. The frailness of the Riker mounts in which the leaves were exhibited is a disadvantage.

Either the present ones would be reinforced or more substantial ones be obtained.

"Photograph Cases. The photographs, which proved very attractive and interesting, should be so labeled as to make them self-explanatory, and if arranged in series showing nurseries, seedlings, planting operations, young and mature forests, means of protection, lumbering operations, etc., they would tell complete stories and would be much more efficient as an exhibit.

"Lantern Slides. As in the case of the photographs, the lantern slides should be arranged in series and properly labeled. On account of their unusual attractiveness, this part of the exhibit should be enlarged, adding a number of large transparencies.

"Erosion Model. (See Plates 3 and 4).

The erosion model made by Prof. G. N. C. Henschen, attracted a great deal of attention while it was in working order, but on account of its leaky condition, it is suggested that a copper lined model (4 ft. x 4 ft.) be made showing only the two hills and a dam where the clear water from the 'forest covered' hill will accumulate. A fine spray should also be obtained.

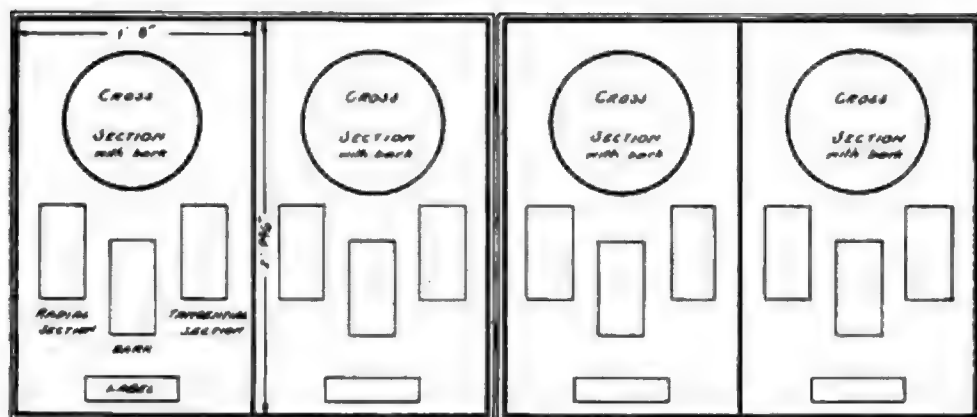
"Instruments. The display of instruments should be enlarged adding tools and instruments used in nursery work, planting, felling, surveying, mensuration, and protection. These should be placed in permanent cases which should be locked. The words 'Pennsylvania Department of Forestry' should be stamped or engraved on the instruments. This last suggestion is prompted by the unfortunate loss by theft of an aneroid barometer, an Abney's level, and a Klausner's hypsometer.

"Diagrams. Curves and charts showing rate of growth, etc., should be of a permanent nature. This could be accomplished by placing them in frames covered with glass. They should be adequately labeled and arranged so that they will be most easily understood.

"Nursery Beds. Two nursery beds containing live seedlings, one 12 x 4 feet, the other 24 x 4 feet, were exhibited. Each was 8 inches deep, and the seedlings were planted in rows running parallel to the ends of each bed and spaced 4 to 8 inches apart, appearance being the chief consideration in the matter of spacing the rows.

"This exhibit was a failure in that the seedlings shed their leaves shortly after the beds were installed, and the bare seedlings made a poor appearance. Autumn is thus a poor time to exhibit live seedlings. Instead of the nursery beds, it is suggested that there be a number of series or sets of lantern slides or photographs of seedlings, each series showing the size and appearance of a certain species at various ages. This will cut down expenses, save time, and prove as effective or more so than nursery beds, especially in fall exhibits. Live seedlings should be used for exhibits in the spring only.

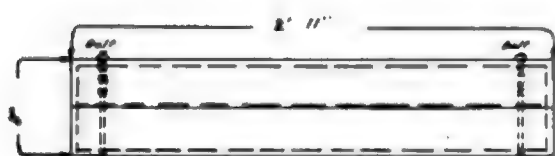
"Birds. The collection of birds loaned by the State Museum was not exhibited because of danger of being damaged or stolen. The birds are, however, an important part of the exhibit on account of their economic value. Besides a name card for each bird, there should be added diagrams showing the kinds and amounts of different foods eaten by birds, and signs telling why and how birds are of economic importance.



TOP VIEW - OPEN



SIDE VIEW - OPEN



FRONT VIEW - CLOSED

PLAN I

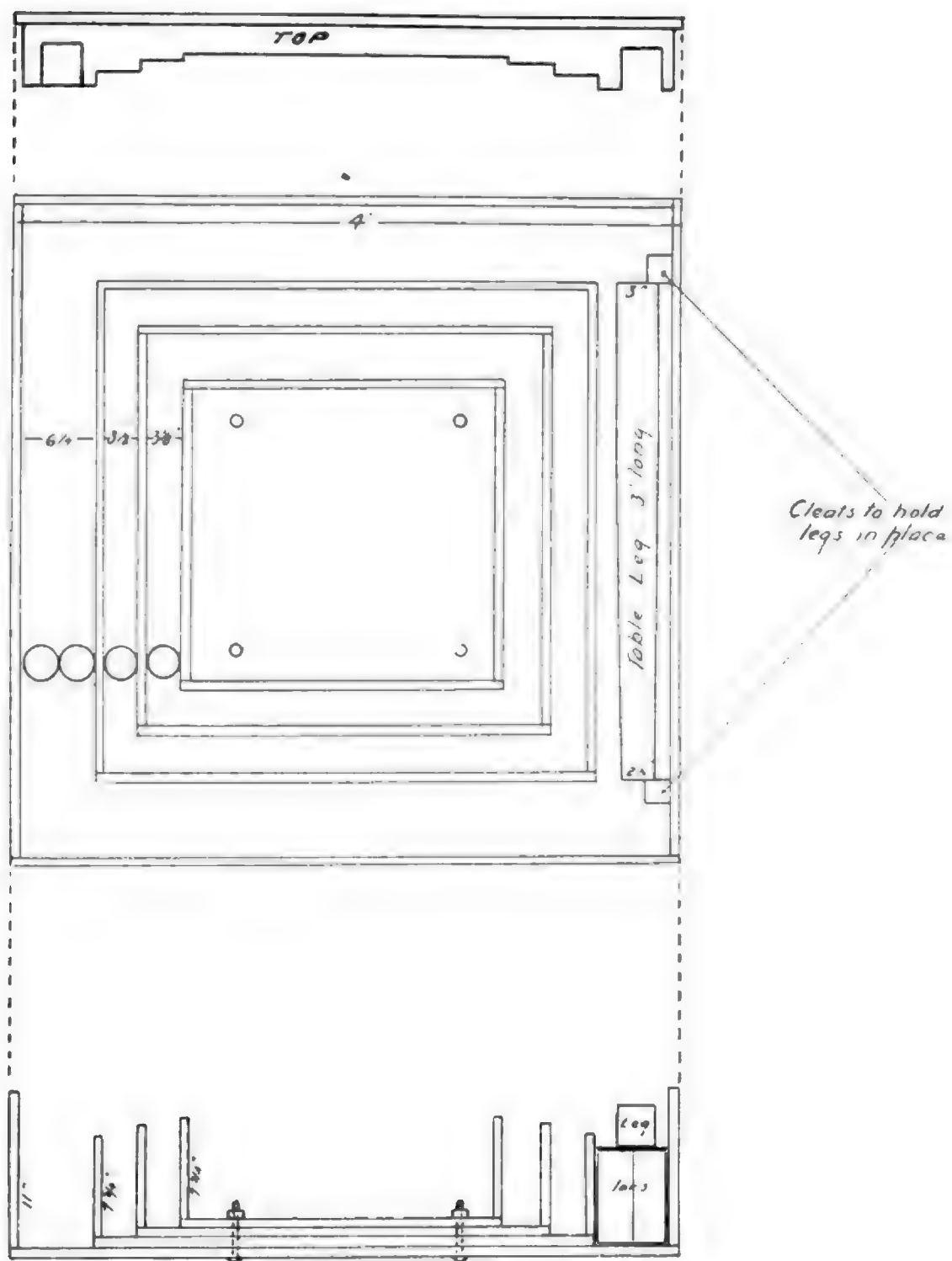
PLAN OF WOOD SPECIMEN CASE WITH SPECIMENS

Cross section - 12" diameter 1 1/2" thick
 Radial " - 8" x 4" x 1"
 Tangential " - 8" x 4" x 1"
 Bark - 8" x 4"

Scale 1 inch = 1 foot

Feb 1914

JAMES E. FINEAL
 MAURICE MUSTIN



PLAN FOR SEED-JAR TABLE AND PACKING CASE.

PLAN II

James E. McNeal
Maurice Mustin

"Birds are displayed to best advantage when arranged on and around a few trees, pine trees preferably, as at the exhibition in Philadelphia at Horticultural Hall, May, 1913. It is, of course, evident that a display of those birds which feed especially on insects injurious to shade and forest trees, is most desirable.

"*Seeds.* The 103 jars of seeds from as many species of Pennsylvania trees, attracted much attention and drew forth such questions as 'How are tree seeds obtained?' 'How are they planted?' 'Where obtainable?' etc.

"For convenience and economy in shipping and setting up, it is suggested that the jars of seeds be packed in a nest of boxes (See Plan II) which boxes might be used as a stand on which to display the seeds. A permanent cloth or canvas cover which can be removed, should be made for the table when set up.

"*Signs.* This part of the exhibit is of great value, but some of the present signs should be revised and new ones should be made to fit the sides of tables used for seed jars, photograph cases, etc.

"*Literature.* The distribution of literature is one of the most important phases of educational work. The following literature was distributed:

Department Reports, 1907, 1908-09, 1910-11.

Map of State Forests and statistics (Dept. circular).

Auxiliary Forest Reserve Bill (Dept. circular).

Penna. Forest Fire Facts and reproduction of Forest Fire Sign (Dept. circular).

Information concerning the State Forest Academy (Dept. circular).

Game Protection. (Bulletin No. 1 Penna. Game Commission).

Wild Bird Protection. (Bulletin No. 2 Penna. Game Commission).

Report on Penna. Chestnut Blight Conference, Feb. 20, 1912.

The Chestnut Blight. (Bulletin No. 1 Chestnut Blight Commission).

Treatment of Ornamental Chestnut Trees Affected with Blight Disease. (Bulletin No. 2 Chestnut Blight Commission).

The Symptoms of Chestnut Tree Blight and a Brief Description of the Blight Disease, by F. D. Heald, Pathologist. (Chestnut Blight Commission).

Report of Chestnut Tree Blight Commission, July 1 to December 30, 1912.

State Forest Academy, 10th Anniversary, 1903-13 (Dept. Report).

"An attempt should be made to supply such literature as will appeal to the type of people who visit the exhibit.

"The exhibit closed Saturday night, October 18, 1913. The work of packing up and preparing the exhibit for return shipping occupied one full day, and on Monday evening, October 20th, the material was on its way back to Harrisburg.

"*General Remarks.* From the fact that the educational phase of the forestry movement is of primary importance, it is altogether fitting that work along this line be as efficient and extensive as possible. The suggestions in this report, prompted by past experience,

are made with the hope of developing efficiency and cutting down the expense of transportation and handling material. Had the exhibit been more efficient, a saving of about 50 per cent. on the cost could have been made in this instance alone.

"Before installing the exhibit, a plan of the floor space showing lights, windows, entrances, etc., should be obtained. A plan should be made before the work of setting up is begun, placing each article or group of articles in places most advantageous for their exhibition. This should be done in the office before the exhibit is shipped.

"If it is possible to obtain a general idea of the type of people who will visit a proposed exhibit, it seems advisable to arrange such an exhibit as will appeal to that type. It does not seem practical, if best results are to be obtained, to send the same exhibit to an industrial or mining community as is sent to a farming district.

"It is suggested that an appropriate exhibit be arranged and sent to county fairs, farmers' meetings, etc. It is not necessary to send articles which would be damaged by exposure in a tent, and if the exhibit were arranged so as to encourage the development of Auxiliary Forest Reserves or a kindred phase of the work, it seems that such an exhibit would be well worth while. In exhibiting in an industrial community, the work of wood preservation, economic utilization, and general conservation should be brought out.

"A guide book containing descriptions of all articles together with general information, and receptacles for distribution of literature marked 'Take One' and 'For Specific Information write to Department of Forestry, Harrisburg, Pa.' would eliminate the necessity of having some one constantly in charge.

"It is suggested that a model reserve be built in relief showing

- Forest types common in Pennsylvania
- Boundaries of forests, compartments, etc.
- Nursery
- Plantations
- Fire towers
- Telephone lines
- Roads, trails, railroads, and fire breaks
- Burned over areas
- Cut over areas
- Saw mills
- Villages, etc.

"The relief map of the State which attracted so much attention in Philadelphia in May, was not sent to Pittsburgh. Because of its value it should be included in future exhibits if possible."

PYMATUNING SWAMP SURVEY.

In the early part of 1912 a request was made by the Water Supply Commission for more detailed information respecting the woody growth to be found in the region embraced within the Pymatuning Swamp project. Since the swamp is not accessible in ordinary weather, it was necessary to make this survey during the frozen period when persons might walk over the surface of the sloughs and bogs. Accordingly, the Department, wishing to accede to the above request, detailed two of its foresters, Messrs. H. E. Bryner and John L. MacAvoy, to make this study. They spent upwards of eleven days in the region doing this work, and their report thereon is as follows:

“New Germantown, Pa., March 18th, 1912.

“Mr. R. S. Conklin,
Harrisburg, Pa.

“Dear Sir: Attached hereto are sheets containing reports on Valuation Survey of the Pymatuning Swamp lying along the Shenango Creek in Crawford county, Pennsylvania.

“Any inaccuracies found in this report may be ascribed to the circumstances attending the survey, which will be found summarized herein.

“In calculating stumpage, figures were based on proximity of areas to Linesville, Pennsylvania, or to Padanarum, Ohio, as the persons who are now logging the swampy areas are hauling the logs to one or the other of the above places.

“This survey, as nearly as was practicable, was made in accordance with the instructions of Mr. Haslam, field engineer in charge of the survey for the proposed dam.

“Hoping this meets with your entire approval, we beg to remain,

Yours most respectfully,

(Signed) H. E. Bryner,
(Signed) J. L. MacAvoy,
Foresters.”

Circumstances Attending Valuation Survey of Pymatuning Swamp Which Will Tend to Promote Inaccuracy.

The only valuable timber on the swampy areas is in process of being logged out.

No previous survey having been made, no exact area lines could be mapped out.

In nearly all cases, the timberland graded so easily into brush, that no well-marked line separates the different classes.

The immense quantity of dead and down timber and the short time during which the swamp remained passable, prevented a rigid strip survey.

Two feet of snow being on the ground, the down timber could be estimated only in part, and the cost of timber clearing is obtained with difficulty, because logging is almost impossible except for a very short time. It is only during an exceedingly cold and protracted winter, such as the present one, that horses may enter the lower sections of the swampy area.

This survey was made barely in time, as on the last two days of work, it was no uncommon occurrence for one to sink through the slushy snow and at least a foot into the mud.

In figuring costs in the following report, all non-merchantable material was classed as waste to be burned. On account of abundance of soft coal, cord wood finds little or no market.

Plot No. 1.

Plot is located on the southeastern end of the swamp just north of Hartstown and lies between the curved and the straight line of the Bessemer Railroad.

The forest floor is covered with a large amount of dead and down timber of no value, which will cause heavy expense for removal.

The undergrowth is thick and is composed of alder and sumac, while a belt of mixed brush and trees encircles the plot.

The area contains per average acre the following volumes by species with their respective stumpage values:

Species.	Board Feet.	Stumpage Per M.	Value.
Elm.	860	\$10 00	\$8 60
White pine.	290	12 00	3 48
Hemlock.	120	10 00	1 20
Red maple.	90	4 00	36
Black ash.	4,000	7 00	28 00
	5,360	.....	\$41 64

The cost of clearing an average acre after the merchantable timber has been logged off will approximate \$16.00.

Subtracting the latter from the former in the above indicates a balance of \$25.64 profit per acre remaining.

Plot No. 2.

Plot is located on the east side of the Shenango Creek between the road from Conneaut Lake to Espyville and the road from Shermansville southwest across the Shenango swamp.

The ground is covered with a dense mass of down timber of no value.

The undergrowth is thin and is composed of alder, sumac, birch, and maple. A heavy growth of brush fades into forest with no good line of demarcation.

The area contains per average acre the following:

Species.	Board Feet.	Stumpage Per M.	Value.
White pine,	400	\$12 00	\$4 80
Black ash,	1,100	7 00	7 70
Hemlock,	200	10 00	2 00
Maple,	260	4 00	1 12
Birch,	170	4 00	68
Elm,	40	10 00	40
	2,190	.....	\$16 70

The cost of clearing an average acre after the merchantable timber has been logged off will approximate \$14.50.

The above figures show that the area will have a balance of \$2.20 profit per acre.

Plot No. 3.

Plot is located on the western side of the Shenango Creek between the straight line of the Bessemer Railroad and the road from Shermansville running southwest across the Shenango Swamp.

The forest floor has a small amount of down timber of no value and the undergrowth is thin and is composed of alder and sumac.

Brush covers about one-third of this area.

The plot contains per average acre the following:

Species.	Board Feet.	Stumpage Per M.	Value.
Tamarack,	1,280	\$7 00	\$8 96
White pine,	920	12 00	11 04
Black ash,	130	7 00	91
Hemlock,	90	10 00	90
Beech,	260	4 00	1 04
Yellow poplar,	30	10 00	30
	2,710	.....	\$23 15

The cost of clearing an average acre after the merchantable timber has been logged off will approximate \$14.00.

The above figures indicate a balance of \$9.15 profit per acre.

Plot No. 4.

Plot is located on northeast side of Shenango Creek and lies between the road from Shermansville running southwest across the swamp and the Erie and Pittsburgh Railroad.

The stand is mainly tamarack (larch), although black ash is strong in certain sections.

The undergrowth is thick and is made up of hazel, sumac, and alder. The edges of the area are very brushy and grade into the woods so slowly that no line could very well be drawn between the two kinds of land.

The average acre on this area contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Tamarack,	2,150	\$8 50	\$18 28
Black ash,	620	8 50	5 27
White pine,	180	13 50	2 43
	2,960	.....	\$25 98

The cost of clearing an average acre after the merchantable timber has been logged off will approximate \$12.00.

Figures above show a balance of \$13.98 profit per acre.

Plot No. 5.

The plot is located on the southwest side of the Shenango Creek and lies between the Erie and Pittsburgh Railroad and the road from Shermansville running southwest across the swamp.

The stand is very open and the tops are bushy, with but a small amount of undergrowth.

The trees in many cases stand bunched like a coppice formation. A large part of the merchantable timber has already been cut.

The area contains per average acre the following:

Species.	Board Feet.	Stumpage Per M.	Value.
Maple,	2,000	\$5 00	\$10 00
Black ash,	1,000	8 00	8 00
Elm,	480	11 00	5 28
Beech,	880	5 00	4 90
	4,460	.....	\$28 18

The cost of clearing an average acre of this area after the merchantable timber has been logged off will approximate \$6.00.

The above figures indicate for this area a balance of \$22.18 profit per acre.

Plot No. 6.

Plot is located on the northeastern side of the Shenango Creek and lies between the Erie and Pittsburgh Railroad and the road to Whaley Island.

Stand is thin and occurs only in small spots, about eighty-five per centum of the area being dense brush only.

This area per average acre contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Beech,	690	\$5 50	\$3 79
Hemlock,	310	11 50	3 56
Birch,	20	5 50	11
White pine,	100	13 50	1 35
	1,120	.....	\$8 81

The cost of clearing an average acre of this area after the merchantable timber has been logged off will approximate \$8.00.

The figures in above calculation indicate for this plot a balance of \$0.81 profit per acre.

Plot No. 6a.

Plot is located on the northeastern side of the Shenango Creek and lies between the road to Whaley Island and the Padden Creek.

The stand is very close in some parts and open in others and one part of the area is standing with dead, fire-killed tamarack which is in fair condition and might be used for mine timbers.

The undergrowth is alder, sumac, and huckleberry and is rather dense in the burnt portions.

An average acre on this area contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Tamarack,	1,900	\$7 50	\$14 25
Maple,	680	4 50	3 06
Hemlock,	100	10 50	1 05
Pine,	200	12 50	2 50
	2,880	.....	\$20 86

The cost of clearing an average acre on this area after the merchantable timber has been logged off will approximate \$14.00.

From the above figures it will be seen that this area will show a profit of \$6.86 per acre.

Plot No. 7.

Plot is located to the southwestern side of the Shenango Creek and lies between the Erie and Pittsburgh Railroad and the treeless flat about a quarter of a mile wide which is in line with the dotted road extending on the field map northward from a road paralleling the Shenango about one mile south of the creek and about a mile and one-half northeast of Espyville (town).

The undergrowth in this area is scant and is mostly alder.

The stand has been rather well lumbered over and can be worked almost any time except during the spring and autumn seasons.

An average acre on this area contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Maple,	300	\$4 00	\$1 20
Elm,	1,280	10 00	12 80
Black ash,	80	7 00	56
	1,660	.....	\$14 56

The cost of clearing an average acre on this area after the merchantable timber has been logged off will approximate \$9.00.

The above figures show a profit of \$5.56 per acre.

Plot No. 8.

Plot is located on the southwestern side of the Shenango Creek and lies between the treeless flat which forms plot No. 7's western end and road on which Pollock's bridge is situate.

Forest floor has slight amount of useless down timber and has thin undergrowth of ash and alder.

This area contains per average acre:

Species.	Board Feet.	Stumpage Per M.	Value.
Ash,	2,360	\$7 00	\$16 52
Maple,	1,570	4 00	6 28
Elm,	1,000	10 00	10 00
Beech,	140	4 00	56
	5,070	.....	\$33 36

The cost of clearing an average acre after merchantable timber has been logged off will approximate \$9.00. Profit \$24.36 per acre.

Plot No. 8a.

This plot and plots 8b and 8c are located north of the Linesville to Padanaram road between the third and second roads west of Linesville which run north and south. Plot 8a is farthest west, plot 8b is farthest north, and plot 8c is farthest east of the plots.

Plot 8a per average acre contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Maple,	1,060	\$5 00	\$5 30
Black ash,	2,250	8 00	18 00
Elm,	770	11 00	8 47
	4,080	.....	\$31 77

Plot 8b per average acre contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Pine,	100	\$13 00	\$1 30
Hemlock,	64	11 00	70
Elm,	30	11 00	33
Maple,	140	5 00	70
	334	.....	\$3 03

Plot 8c per average acre contains:

Species.	Board Feet.	Stumpage Per M.	Value.
White pine,	30	\$13 00	\$0 39
Black ash,	264	8 00	2 11
Maple,	185	5 00	92
Elm,	20	11 00	22
	499	.....	\$3 64

Clearing of the above sub-plots after logging will approximate an expense, as follows: Plot 8a, \$8.00; plots 8b and 8c, \$7.00 per acre. Plot 8a shows a profit of \$23.77 an acre; 8b, \$3.97 loss an acre; 8c, \$3.36 loss an acre.

Plot No. 9.

Plot comprises all swamp land (woods) lying north and west of Clark's on Linesville to Padanaram road. Bounded on the west by north and south road parallel to and about one-quarter mile east of the Ohio line. The northern limits are about two miles north of Clark's. The plot is badly cut up and the woods are scattered with many areas of brush extending through the main body.

This area contains per average acre the following:

Species.	Board Feet.	Stumpage Per M.	Value.
White pine,	36	\$12 00	\$0 43
Hemlock,	60	10 00	50
Black ash,	1,100	7 00	7 70
Elm,	290	10 00	2 90
Maple,	500	4 00	2 00
	1,986	.....	\$13 63

This area will approximate \$12.00 for clearing after logging. Above figures indicate a profit of \$1.63 per acre.

Plot No. 9a.

This sub-plot is contained in the small rectangle beginning at Clark's and running north and east, comprising about seventy acres. It is not swamp land but lies on high ground.

The area contains per average acre:

Species.	Board Feet.	Stumpage Per M.	Value.
Beech,	3,100	\$4 00	\$12 40
Hemlock,	240	10 00	2 40
Maple,	1,400	4 00	5 60
Elm,	1,000	10 00	10 00
	5,740	.....	\$30 40

Cost of clearing this plot per acre after logging will approximate \$5.00.

The above figures indicate a profit per acre of \$25.40.

Plot No. 10.

Plot is located between road upon which Manning bridge is situate and road upon which Pollock bridge is situate, and extends north from Manning bridge to a line drawn directly east from house occupied

by Mr. Phelps on Manning bridge road. Plot 10a is burned area directly north of Plot No. 10, and abuts on the Linesville road.

Plot No. 10 has medium heavy timber lying down but which is of no value. The undergrowth is dense in spots and the timber is only fair. The plot contains per average acre:

Species.	Board Feet.	Stumpage Per M.	Value.
Maple,	3,300	\$4 00	\$13 20
Birch,	350	4 00	1 40
White pine,	800	12 00	9 60
	4,450	.....	\$24 20

The cost of clearing an average acre on this plot after the merchantable timber has been logged off will approximate \$10.00. The above shows profit of \$14.20 per acre.

Plot No. 10a has been severely burned over and only a few acres of poor timber are left standing. This material will not bring in any return. The plot as a whole will have an approximate cost for clearing per acre of \$10.00.

Plot No. 11.

This plot is located on both sides of the Ohio line and is bounded on the south by Sherry's lane and a line from end of said lane to Manning bridge. It is bounded on the east by Manning bridge road, on the west by Padanaram to Andover road, and on the north by the Padanaram to Linesville road.

The undergrowth in this plot is rather dense and consists of alder and aspen. The stand is mainly ash which is generally poor in quality.

The stand per average acre will contain:

Species.	Board Feet.	Stumpage Per M.	Value.
Tamarack,	22	\$8 00	\$0 18
Maple,	500	5 00	2 50
Black ash,	2,500	8 00	20 00
Elm,	360	11 00	3 96
	3,382	.....	\$26 64

The cost of clearing the average acre on this tract after the merchantable timber has been logged off will approximate \$12.50. The above figures indicate for this area a profit of \$14.14 per acre.

Plot No. 12.

This area extends from one-half to three-quarters of a mile on each side of the Ohio line for a distance of about two miles directly south from Sperry's lane. The southern limit of the plot lies in a growth of aspen and is formed by the ending of the barb wire fence which runs north along the state line at that point. This point is about one-half mile north of mile stone No. 27 on the state line. Engineer Ferris knows exact point.

The area is overflow land for the creek bed, and is either burned over and containing nothing but stumps or else the trees are so bushy as to be of no use except for fuel, and, as such, will be a drug on the market in that neighborhood, for soft coal is commonly used and cord wood finds little or no market.

South of plot 12 and between it and Plot 13 is a large area of dense brush and aspen which will be a large expense for clearing.

The cost per average acre of clearing plot No. 12 will approximate \$7.50.

Plot No. 13.

Plot is located along state line and begins at a wire fence running across state line about one-half mile below lower limit of plot 12. Its southern limit is about one-eighth of a mile north of state line milestone No. 28, and may be recognized easily by the distinct break in the wood, which is about a quarter mile wide.

This area has been lumbered over in large part and lumbering is still under process. The floor is clear of fallen timber and, except in isolated areas, there is little or no undergrowth, although a narrow belt of brush fringes the area.

This plot per average acre contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Swamp white oak,	260	\$13 00	\$3 38
Elm,	780	12 00	9 36
Black ash,	1,510	9 00	13 59
Maple,	530	6 00	3 18
Beech,	140	6 00	84
	3,220	.....	\$30 35

The cost per acre of clearing this plot after the merchantable timber has been logged off will approximate \$6.00.

The above figures show for this area a profit of \$24.35 per acre.

The land in No. 13 which lies on the Ohio side of the line is covered with timber worth twice per acre that in Pennsylvania.

Plot No. 14.

This plot is located along the state line and extends north as far as the branch of the creek which crosses state line about one mile above the road passing west through Westford, Pa. It also crosses the state line about two miles southwest of Westford. The southern limit of the plot is the road mentioned above. This area is in two sections, the southern one being circular in outline and containing very few acres. The one north of it and larger, is a long strip which lies directly along the state line.

The forest floor is clear of down timber. The undergrowth is scant as is the regeneration of the standing timber.

Per average acre, this tract contains:

Species.	Board Feet.	Stumpage Per M.	Value.
Beech,	2,480	\$6 00	\$14 88
Black ash,	690	9 00	6 21
Elm,	1,270	12 00	15 24
Maple,	950	6 00	5 70
Swamp white oak,	260	13 00	3 38
Basswood,	450	12 00	5 40
	6,100	.....	\$50 81

Cost of clearing an average acre of this tract after the merchantable timber has been logged off will approximate \$6.00. The above figures indicate a profit of \$44.81 per acre.

FINANCIAL STATEMENT.

The period of this report, January 1, 1912 to December 31, 1913, is not coincident with the appropriation fiscal years, consequently there will be an overlapping of funds. The period from January 1, 1912 to June 1, 1913 was covered by the appropriation made at the session of 1911, while the period from June 1, 1913 to December 31, 1913 is covered by appropriations made at the session of 1913.

The appropriations made for this Department at the session of 1911 are as follows:

Salaries of officers and clerks specifically provided for by statute,	\$17,000 00
For special examinations to encourage and develop forestry and for contingent expenses,	6,000 00
Traveling expenses, Members of the Commission,	3,500 00
Foresters' salaries and expenses,	110,000 00
Forest Rangers' salaries and expenses,	125,000 00
Surveys,	10,000 00
Draftsmen, Bookkeepers, Stenographers, and Messengers,	12,000 00
Labor,	100,000 00
Maintenance, protection, care, planting, and development of State Forests,	55,000 00
Title Examination,	5,000 00
Fixed Charges for Roads,	40,000 00
Fixed Charges for Schools,	40,000 00
Prevention and Extinction of Forest Fires, and Expenses,	50,000 00
Purchase of Lands,	50,000 00
Forest Academy,	20,000 00
Rebuilding of the dam at Promised Land pond in Pike county,	1,000 00
Deficiency for the prevention and extinction of forest fires, and expenses,	29,000 00
Total,	\$673,500 00

The appropriations made for the Department at the session of 1913, are as follows:

Salaries of officers and clerks specifically provided for by law,	\$17,000 00
Contingent Expenses,	5,000 00
Traveling Expenses Members of the Commission,	5,000 00
Foresters' salaries and expenses,	110,000 00
Forest Rangers' salaries and expenses,	125,000 00
Draftsmen, Bookkeepers, Stenographers, and Messengers,	15,000 00
Surveys,	10,000 00
Labor,	100,000 00
Title examination,	4,000 00

Maintenance, protection, care, planting, and improvement of State Forests, and for the encouragement, promotion, and development of forestry,	65,000 00
Fixed Charges for Roads,	40,000 00
Fixed Charges for Schools,	40,000,00
Purchase of Lands,	50,000 00
Prevention and Extinction of Forest Fires, and Expenses, State Forest Academy,	50,000 00
Deficiency for Title Examination,	20,000 00
Deficiency for the prevention and extinction of forest fires, and expenses,	5,514 21
Deficiency, traveling and necessary expenses of Members of the Commission,	2,798 43
	126 30
Total,	<hr/> \$664,438 94

From the above appropriations there were expended during the two calendar years covered by this report, the following amounts:

Salaries of officers and clerks, specifically provided for -	
by law,	\$17,000 00
Foresters' salaries and expenses,	115,670 60
Forest Rangers' salaries and expenses,	119,155 18
Expenses Members of the Commission,	3,780 37
Title Examination,	8,742 36
Surveys,	2,448 73
Maintenance, protection, care, planting, and improvement of State Forests, and for the encouragement, promotion, and development of forestry,	62,101 58
Labor,	103,077 55
Forest Academy,	19,886 51
Special examinations and Contingent Expenses,	5,841 74
Draftsmen, Bookkeepers, Stenographers, and Messengers,,	12,220 00
Purchase of Lands,	94,279 56
Forest Fires,	30,506 02
Fixed Charges for Schools,	38,243 30
Fixed Charges for Roads,	38,690 18
Total,	<hr/> \$671,643 68

It must be borne in mind that the period from January 1, 1914 to June 1, 1915, a year and five months, is likewise provided for by the above appropriations made at the session of 1913, but the expenditures for said period may be included only in the next report after the termination of the period ending June 1, 1915.

Receipts from the State Forests January 1, 1912 to December 31, 1913.

The State Forests during the period of this report yielded better returns than formerly, because of the better development and additional tree growth thereon, averaging more than \$1,000 per month. A statement of the returns by forests during the above period is as follows:

Forest.	Amount.	Amount.
Stone,	Asaph,	\$1,387 34
Bald Eagle, .....	.....	95 76
Bedford, .....	.....	24 96
Seven Mountain,	Bear Meadows,	3 75
Seven Mountain,	Barree,	2,065 44
Black Forest,	Blackwells,	74 82
Buchanan, .....	.....	6 50
White Deer,	Buffalo,	432 66
South Mountain,	Caledonia,	3,357 09
Stone,	Chatham,	408 62
Clearfield,	Clearfield,	1,500 00
Seven Mountain,	Coburn,	117 81
Kettle Creek,	Crossfork,	114 00
Seven Mountain,	Greenwood,	34 00
Grays Run, .....	.....	101 30
Sinnemahoning,	Hull,	165 32
Seven Mountain,	Jacks Mountain,	23 71
Clearfield,	Karthaus,	114 36
Seven Mountain,	Kishacoquillas,	16 00
Kettle Creek,	Ledy,	61 48
Loyalsock, .....	.....	35 78
South Mountain,	Mont Alto,	2,792 29
Sinnemahoning,	Medix,	587 00
White Deer,	McCall,	16 00
McClure, .....	.....	137 00
McElhattan, .....	.....	43 47
Minisink,	Notch,	58 43
Pennypacker, .....	.....	117 98
South Mountain,	Pine Grove,	15 00
Minisink,	Pocono,	907 65
Seven Mountain,	Poe,	19 32
Hopkins,	Renovo,	3,525 52
Rothrock, .....	.....	37 00
Sinnemahoning, .....	.....	4,851 28
Black Forest,	Slate Run,	773 18
Hopkins,	Snow Shoe,	5 00
Stuart, .....	.....	1,279 80
Trough Creek, .....	.....	20 00
Black Forest,	Waterville,	29 00
Minisink,	Westfall,	18 00
Rush township, Centre county lands (unattached), .....	.....	243 12
Office (damage refund by Adams Express Co.), .....	.....	5 00
O. C. Gilbert (refund on bond), .....	.....	500 00
Total, .....	.....	\$26,161 74
Total receipts from all sources from organization to December 31, 1913, .....	.....	\$76,158 67

In accordance with Section 2701 of the State School Code, P. L. 1911 p. 431, 80 per cent. of the net receipts and proceeds from the State Forests shall be paid into a fund known as "The State School Fund of Pennsylvania." With the development of the State Forests and the great increase of revenue to be derived therefrom, it is fair to assume that the State School Fund in the near future will be greatly enlarged through the State Forest revenues. Why the Legislature designated but 80 per cent. of the net revenues to be devoted as afore-said is not known. It would be entirely satisfactory to this Department, and we believe entirely proper, should the whole revenue of State Forests be devoted to the purpose of the School Fund.

In accordance with the financial statement published in the report of this Department for the years 1910-11, page 95, it is shown that all expenditures to December 31, 1911, made for and on behalf of this Department from Legislative appropriations, amount to \$3,295,897 40. During the years 1912-13 covered by this report, all expenditures for all purposes, as shown above, amount to, 671,643 68

Total expenditure for all purposes from the beginning of the work of the first Commission, June 1, 1893, to December 31, 1913, a period of 20 years and 7 months, \$3,967,541 08

Average expenditure per year by the Department of Forestry and its predecessors for all purposes, \$192,786 25

Included in the above appropriations is the cost of the land, the title examination, and the fixed charges which have been paid out of the Department appropriations for the lands set aside for the use of the Western Penitentiary in Centre county, and the Sanatorium at Mont Alto in Franklin county, now in charge of the State Health Department. Since these lands have been devoted to other uses than forestry, it is fitting that the Department should be credited with the expenditures for the above purposes made on account of these particular tracts. A statement of the area, cost, fixed charges for roads and schools, and an estimate of the cost of the title examination, is as follows:

Lands in Centre county set aside for the use of the Western Penitentiary:

Area,	943 acres, 82.9 perches
Cost,	\$2,576 69
Fixed charges for road purposes 1905 to 1912 inclusive,	337 32
Title examination,	126 50

Land in Franklin county set aside for the use of the Sanatorium:

Area,	569 acres
Cost,	\$1,963 05
Fixed charges,	204 84
Title examination,	76 82

Total for both tracts, \$5,285 22

Deducting the amount so found from the total expenditures to December 31, 1913, above shown, leaves a balance of \$3,962,255.86, which is the full amount that should be charged against the Department for all its operations to date.

STATE FOREST ADMINISTRATION

For the Years 1912 and 1913.

1. THE BALD EAGLE FOREST.

Forester, Edgar H. Smith, Elimsport.

Forest Rangers:

Susquehanna Division, Joseph Manley, Montgomery No. 2.
Nippenose Division, Stephen L. Mull, Elimsport.

The Bald Eagle Forest is situate in southern Lycoming county, extending from the Susquehanna River five miles south of Williamsport, westward along the Bald Eagle mountain upon the north side of White Deer Valley a distance of 18 miles. It has a southern exposure and 90 per cent. of the area lies along this mountain. About 80 acres of abandoned fields and 1,000 acres of woodland lie in the bottom of the valley.

For convenience in administration, two divisions have been erected, the eastern or Susquehanna, and the western or Nippenose. The forester and the two rangers constitute the present regular service employees. Forester Smith was assigned to this station April 1, 1912.

The boundary survey is complete, having been finished in 1911. Because of the general unsettled condition of boundary lines, a number of complaints were made by individuals that the survey had taken in small portions of areas claimed by them. These were investigated and disposed of satisfactorily by the forester with the exception of two cases, wherein it was finally determined by the surveyor of the Department that the areas actually belonged to the claimants, and the exterior boundary lines accordingly reformed. The lines are now posted and painted and 30 per cent. brushed out. Boundary lines are cleared for fire lines. All line corners are prominently built except two, one of which is below high water mark in the Susquehanna River, and the other at a place to which stone must be hauled for the building of the corner.

As a result of the survey the area of this reserve is computed at about 17,000 acres. It contains no virgin forest. In places difficult of access, a sparse growth of mature pitch and white pine remains. This area not having been seriously burned, is regenerating itself naturally in a satisfactory manner. Artificial planting must be resorted to in many places to fill in gaps. Two thousand acres have

a density of 90 per cent. A stand of hardwoods with a density of 50 per cent., about 3,000 acres, is in need of improvement cutting. The eastern division, near market, is being so improved. This problem is more serious in the western division, which is distant from market. Much of the natural regeneration is of desirable species. The improvement cutting is to stimulate this kind of growth and remove inferior stock. About 12,000 acres of the forest contain a stand of from only 10 per cent. to 50 per cent., principally hardwoods with a few pines, and needs much artificial strengthening. The balance of the area, about 500 acres, is brush and must be assisted with planting. On this small area a severe burn occurred in 1910.

Water covers about 8 acres of this forest. Thirty-five acres are devoted to roads and trails, and 35 acres to fire lines thus far completed. Open ground covers 48 acres.

Springs and Streams.

Eight good springs are found in this forest, all cleaned and accessible. Six flow continuously. They have as yet received no definite names, the best known being commonly called the **Watering Trough**, on the road leading from White Deer Valley to Williamsport, and is used by all teams traveling that road.

The White Deer Hole Creek is the only stream of any size in the forest. It takes its rise just outside of the western boundary and flows through the State Forest for a distance of three miles. Its flow is regular, made possible by the well forested condition of the land near its head, the woods here being almost normal in density. Nothing in the drainage basin is likely to contaminate the stream. One case of wilful contamination came to the notice of the forester, and after due notice the person responsible for it very promptly removed the objection.

Buildings and Repairs.

There are but two buildings in the forest, a cottage and a small barn. Both are in need of repairs. Being in a remote portion of the forest, they are useful and desirable as a base of operations when work is being conducted in that region. There are no fences on this land. The lines of the White Deer Valley Telephone Company run through a portion of the forest, and to which the forester and his rangers have access. It is desirable to build a few short spurs, which will give better protection in case of fire. These may be connected to the main line in several places.

Roads and Trails.

This State Forest is crossed north and south by 4 good roads. A new fire road is to be constructed along the summit of the mountain as nearly as possible, 12 miles of which have already been built. This basic road is intersected by the 4 public roads mentioned and form dividing lines up and down the mountain. Intermediate fire lines following the old warrant lines are being built and divide the forest into working compartments. When this road system is completed it should afford ample protection from fire and give easy means of access to all parts of the forested area. Thirty-three miles of roads and trails were repaired during 1913.

Easements and Leases.

The Pennsylvania Railroad owns a right of way through the extreme eastern end of the forest, and it is from this that the principal danger of fire arises. The telephone company above mentioned carries its lines through a portion of the forest.

A lease or contract is now outstanding with Henry S. Steline for the removal of dead, down, and diseased chestnut cord wood. This yields a small revenue and cleans up the reserve in much better condition than it otherwise would be.

Seed Collection.

Fifteen bushels of black walnuts were collected by the forester and rangers during the two years. They are to be planted in the small forest nursery recently established. The quality of the seed was good, having a germinating per cent. of about 90.

Forest Nursery.

On April 22d, 1912, a small nursery was begun. The area cleared amounts to about 300 square feet, and 2½ pounds of seed were planted. At the end of the growing season the following one-year old seedlings were in hand:

Scotch pine,	15,000
White pine,	8,000
Red pine,	6,000
Norway spruce,	8,000
Douglas fir,	10,000
	<hr/>
	47,000

The cost of the seed and the work in the establishment of the nursery was \$54.56, or \$1.16 per thousand for the seedlings obtained. This small nursery has good drainage, with nearby water from a permanent stream, and the soil is rich, sandy loam. The only objection is its distance from forest headquarters, five miles; but this will be overcome in the near future by better traveling facilities. All nursery labor has been supplied thus far by the forester and his rangers. At the end of the 1913 season it contained the following 2-year old plants:

Scotch pine,	6,000
Norway spruce,	1,000
White pine,	8,500
Black walnut,	10
Douglas fir,	3,500
	<hr/>
	19,010

13,510 of the above will be available for planting in 1914.

Plantation.

A small plantation of black walnuts was made in May, 1912, the seeds being planted three feet apart. The results were not satisfactory, many of the nuts being removed by squirrels, while the germination of the remainder has laid over to the succeeding year.

Fires.

During 1912 there were no forest fires in the Bald Eagle Forest. The forester and one of the rangers were called out to two small fires on private land, and a third call proved to be a false alarm. Two small fires occurred in 1913, doing little damage and covering not more than half an acre each.

No observatory stations have yet been established in this forest, although one may be used with good effect on the point of Nippenose mountain, from which a view over a large territory may be had. At other points where observatories ordinarily would be useful, fog and smoke during the fire season usually collect in such masses that vision is interfered with. For this reason fire protection must rely more upon telephone lines than observation towers.

Labor.

The rate for labor in this region was 16 cents per hour for a 10-hour day in 1912. In 1913 it cost 17½ cents per hour. Teams may

be had at \$4.50 per day with driver, or \$2.50 per day without driver. Labor, while good, is scarce, as most laboring men are hired by the year and are employed among the farmers of the neighborhood.

Improvement Cutting.

An improvement cutting was begun in December, 1912. Two others were undertaken during 1913. The removal of the dead and down chestnut is the principal object. Each of the forest rangers has his own improvement work laid out, to be worked at in odd moments.

Market.

There is a market for the products of this forest when in the form of railroad ties, telephone poles, heading, staves, lagging, hickory, and chestnut cord wood. Ties are quoted at the following prices:

	1st Class.	2d Class.	Culls.
	Cts.	Cts.	Cts.
Red oak and black oak,	56	33	.....
Beech, birch, maple,	48	33	.....
White oak and rock oak,	72	57	.....
White chestnut,	50	35	.....

Telephones poles from.....\$5.00 to \$20.00.
 Heading and staves, delivered, per thousand.....\$1.00
 Hickory, first class, stumpage,\$10.00
 Chestnut cordwood, eastern division, per cord.....30c

All transportation is by wagon to Montgomery or Allenwood, a distance of from 3 to 12 miles. Hauling to Williamport is a distance of from 6 to 20 miles.

A considerable area of chestnut wood infected by the chestnut bark disease is being cleaned up and it is hoped to sell this material to a nearby stave mill. The price for chestnut wood is rising and this diseased material may be disposed of at a profit. A caterpillar has attacked the Scotch pine in large numbers.

Outing and Recreation.

During 1912, the Department issued 5 permits for 39 campers within this forest. In 1913, 14 permits were issued to 57 persons. The campers were law-abiding and orderly and appreciated the courtesy tendered them.

During the 1912 hunting season 9 deer were shot either on or in the neighborhood of the reserve. Wild game bird hunting was also good. The streams afford good trout fishing and numerous persons availed themselves of this form of recreation during the proper season. In 1913, quantities of small game were taken. Three deer and 4 bears were killed.

The camping sites in this forest are not numerous, the good ones being only four in number, and are located at the Fourth Gap, the Third Gap, the Hoffa place, and the Cove, all in the eastern division. All camp sites will be numbered consecutively from 701 to 799 inclusive.

Lightning Report.

During the year 1913 the number of trees struck and shattered is as follows:

	July.	Aug.	Total.
Chestnut,	1	2	3
Pitch pine,	1	1	2
	1	3	4

So far as could be ascertained, none of the trees struck was ignited by the current.

2. THE BEDFORD COUNTY FOREST.

Forester, William L. Byers, Rainsburg.

Forest Rangers:

- J. H. Sparks,¹ Chaneysville.
- John Ott,² Rainsburg.
- Coyle H. Tewell,³ Chaneysville.
- E. H. Smith,⁴ Rainsburg.

The Bedford County Forest not having received any other definite name, is known by the name of the county in which it is located.

1. Died October 13, 1912.
2. Resigned December 31, 1912.
3. Began February 1, 1913; resigned September 30, 1913.
4. Began March 1, 1913.

It is situate in Southampton, Colerain, and Cumberland Valley townships, and contains an area of 10,055 acres, a revision of the area having lately been made by reason of the survey of the exterior boundary, which is now complete except two lines of the Jane Ketterman tract and the recent small Hartsock purchase. That portion of the area on Tussey mountain south of Martin hill is known as the southern range or division, and the remainder as the northern range or division. No men are regularly employed except the forester and his rangers. The boundary lines have been carefully posted and painted, but the brushing out of the lines still remains to be done. There are four small interior tracts and two small exterior tracts which should be added in order to straighten the boundary lines and eliminate all interior holdings.

No virgin woods are found in this forest, the whole area having been lumbered over in the past. 1,177 acres are now set with young trees, which with protection will grow into valuable merchantable timber. A tract of 7,873 acres is not sufficiently stocked to form a profitable stand, and spot planting or seed sowing must be resorted to to bring the stand up to full stock. At least 1,000 acres contain no valuable species and are covered with brush or other growth. A small area of abandoned fields or old farms is sufficiently clear in which systematic planting of seedling trees may be made. The brush on the non-productive area is valuable in that it shades the ground, prevents erosion, and is constantly adding humus to the soil. If systematic planting cannot be profitably resorted to here, small spots must be cleared wherein quick-growing trees should be placed, and these, when of seed-bearing age, will begin to crowd out the scrub and re-seed the ground to valuable species.

Springs and Streams.

A large number of springs is found in this forest. A few of them during seasons of extreme drought dry up completely, but the larger flow the year round. All sorts of inappropriate, coarse, or absurd names are sometimes applied to springs and streams. The endeavor will be to re-name them with more appropriate names and give them greater prominence as development proceeds. The water from 10 different springs flows into Cove Creek and then into the Raystown Branch of the Juniata. Two of these are known to become dry during seasons of drought, while the others are perennial. By reason of lack of roads or good trails, four of them are at present inaccessible. The named springs, marked with boards, are 12 in number.

The water from 3 of the springs in this forest flows into Emmett's Creek, and two of them are perennial springs. One is inaccessible for the reason above stated.

Fifteen springs send their waters into Town Creek, and four of the number become dry during seasons of drought. All are accessible except two. Eight springs flow into Flintstone Creek and two of them are known to become dry during seasons of drought. Three of them are inaccessible by reason of lack of roads.

The above 36 springs existing in this forest abundantly prove that the land is well watered, and the fact that a number of them go dry during seasons of drought is further proof that heavy planting should take place around them as speedily as possible and be continued outward for considerable areas.

By reason of the uninhabited character of the region and the fact that the springs and streams above mentioned lie largely within the State Forest, there is little danger of contamination. It is the constant endeavor of the forest officers to prevent any local nuisance which would result in contamination of these waters.

Buildings and Repairs.

A number of small buildings are located within this forest. A ranger's lodge and stable are on the Herring tract, and two small lumbermen's shanties remain on the Bennett tract. It is recommended that the last named two be torn down and the lumber used to build a tool house and ranger's shelter in the southern division. Slight repairs were made to the best of them during 1913.

The lines of the Bedford and Fulton Telephone Co. cross this forest along the public road from Chaneyville to Beans Cove. With this line as a basis, a valuable and highly useful system could be built up within this region.

Ganister rock is found at several places within the forest, but the great length of haul to a railroad renders it unprofitable at the present time.

Roads.

The road system as heretofore planned remains unchanged, and has been reported upon previously. The total length of roads opened and repaired during 1912 is 24 miles. Total work during 1913 included 9.99 miles of road; 4.25 miles of trail; 14.84 miles of fire lines; and 2 miles of boundary line.

Seeds and Plantations.

A small quantity of seed of various kinds has been collected and planted in open areas within the forest. Three pounds of white pine seed were furnished by the Department in 1912 and sown at proper

places. An experimental planting of black walnut has been made along the creek on the Herring tract, the seedlings having been furnished by a citizen of the neighborhood, and an experimental plantation is intended to be made on the Barren Oak lands in 1913, the clearing for the purpose being now in progress; the object being to learn what valuable species will grow most rapidly on the barren lands, and also to learn the cost of barren land planting. An experimental planting of white pine, Norway spruce, and Scotch pine was also made under the shade of large trees for the purpose of comparison with similar planting made in the open.

The following seedling trees were planted during the year 1912:

Norway spruce, 2-year,	1,170
Pinus ponderosa, 2-year,	2,000
White pine, 2-year,	20,317
Scotch pine, 2-year,	120
Black walnut, 1-year,	15
Red oak, 1-year,	3,700
Hardy catalpa, 2-year,	40
	<hr/>
	27,362

The following planting was done during 1913:

White pine,	20,000
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The following seedling trees have been planted to date at suitable places on this area:

White pine,	108,282
Norway spruce,	1,322
Scotch pine,	795
Yellow pine,	3,035
Red oak,	5,700
Catalpa,	540
Balsam fir,	200
Larch,	700
Sugar maple,	1,500
White ash,	5,830
Walnut,	26
Balsam cuttings,	120
Carolina poplar cuttings,	80
	<hr/>
	128,130

The open areas in the forest have been planted. Two acres of barren oak lands have been planted as an experiment, using white pine trees three years old. The trees show a growth of 95 per cent. Five acres have been planted with seed. The total planted area is 57.78 acres.

Nursery.

A number of years ago Ranger J. H. Sparks started a small nursery and succeeded in growing a considerable number of seedling trees. When the forester took charge the nursery was continued, but being of small size it was never capable of producing seedlings in large quantities. Owing to pressure of development work, the nursery has been abandoned temporarily, but the intention is to resume seed planting at a convenient time in the future. It is believed that this nursery was the first that was undertaken by any of the forester rangers, and Mr. Sparks enjoys the reputation of being the first to begin what has now become a useful adjunct to nearly all ranging work.

Labor.

Labor in this region is scarce and costs 15 cents per hour. Team hire was 30 cents per hour in 1912. It is now 35 cents per hour. The inaccessible location of a large part of the forest and the long haul to market requires the employment of a minimum amount of labor.

Improvement Cutting.

Little or no improvement cutting has been attempted in this forest owing to the distance from market. The product is unsalable. Improvement cutting is needed on a large part of the area, but for the present must be disregarded, and the effort of the forest officers directed to other administrative and development work.

Markets.

There is no market within a reasonable distance except for lumber and ties. Locust wood for pins is also being used, yielding \$4.00 per cord on the stump or \$8.00 per cord at the mill. Material is used down to five inches in diameter and is cut to 50-inch lengths.

Growth of Seedlings.

White pine seedlings growing naturally within an old field have been measured. To show the growth made by plantations, an average seedling was taken to determine its growth for eight years. It shows the following:

1st year growth,	2 inches
2nd year growth,	3 inches
3rd year growth,	4 inches
4th year growth,	12 inches
5th year growth,	10 inches
6th year growth,	10 inches
7th year growth,	31 inches
8th year growth,	24 inches
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Total growth,	96 inches

Average growth, 12 inches per year.

It will be seen, therefore, that the average soil in this forest is productive and that seedling trees will grow at a rapid rate.

Fungous Disease.

The chestnut bark disease has been found sparingly near this reserve, only two cases having been discovered on private lands adjacent to the State Forest up to the spring of 1912. Both infections were destroyed. In December, 1912, a small badly infected area was found on private land at the edge of the State Forest, containing over 400 infected stems. The infection has been destroyed, the bark removed from the stumps, and most of the infected material burned over the stumps. Where logs were obtained from the trees, there being no infection in the log length, the bark was removed and destroyed, the log being saved for future use. Continued outlook is kept for any appearance of this disease. In 1913, three infected areas were found. All infected trees have been cut and burned.

Fires.

During the year 1912 but one forest fire occurred, starting on private land and burning into the State Forest. Owing to the high wind the fire traveled rapidly and did little damage. The area of State land run over was about 900 acres. In 1913, four small fires occurred on State land.

Two observatory trees have been fitted up, one on top of Martin hill and the other on a high ridge to the south of Rainsburg. Most of the forest area may be surveyed from these lookout posts.

Trespass.

One case of trespass was detected and satisfactory settlement made.

Outing and Recreation.

A number of good camping sites are to be found, and at least 6 are now recognized as available for camping purposes. Few camping parties visit this forest because of distance from the railroad and difficulty of entrance. Streams within the forest are small and consequently do not furnish much sport in the way of fishing. So far as known, three deer, four turkeys, and a considerable quantity of small game were taken within the forest during 1912. Much small game was taken during 1913. All camp sites will be numbered consecutively from 801 to 899 inclusive.

Lightning Report.

A record of the thunder storms during 1912 shows a total of 35, occurring as follows:

April,	5
May,	3
June,	5
July,	11
August,	6
September,	5

Trees struck and shattered were as follows:

	June.	July.	Aug.	Sept.	Total.
Chestnut,	1	2	1	2	6
White oak,			1		1
Pitch pine,		1		1	2
	1	3	2	3	9

In 1913, the trees struck and shattered during the year were 8, as follows:

June,	3
July,	2
August,	1
September,	2
	8

Species were as follows:

Pitch pine,	4
Chestnut,	2
White oak,	2
	<hr/>
	8

35 electric storms occurred during this year.

So far as known, no trees were ignited by the current.

3. THE BLACK FOREST.

Forester, Harry A. Thomson,¹ Slate Run.

Forester, Robert R. Neefe,² Slate Run.

Forest Rangers:

P. W. Raemore,³ Slate Run.

C. D. Will,⁴ Slate Run.

The division of the Black Forest over which Forester Thomson had charge, (now Forester Neefe), is located in and around the old pumping station in Brown township, Lycoming county, and comprises portions of the State Forest lying in Clinton, Lycoming, and Potter counties. The forest officers reside in buildings owned by the Department and within easy reach of each other.

A portion of the boundary of this division has not yet been surveyed, and until such survey may be made, has been located as accurately as may be done under present conditions. Surveyed lines are well brushed and marked.

This division contains two interior tracts, one of 105 acres owned by the Black Forest Hunting Club, and the other the Dyer farm. Both these tracts are advantageously located so as to afford additional protection to State lands, and are occupied by persons who have an interest in the work of the Department and in the protection of the woods.

The area of the division is approximately 30,000 acres and contains no virgin forest, the whole area having been lumbered in years gone by. It divides naturally into two blocks, Pine Creek and Young

1. Resigned September 30, 1918.

2. Appointed September 1, 1919.

3. Began March 15, 1912; resigned September 30, 1913.

4. Began September 1, 1912.

Womans Creek. The lumbering was so closely done that there remain no mature trees, and the present young stand at no place exceeds a density of 50 per cent., showing that the best area is but one-half stocked, while 4,000 acres have a density of but 30 per cent. The young trees now coming on consist of yellow pine, chestnut, beech, sugar maple, rock oak, and white oak, with a mixture of much brush. As the trees reach a seed-bearing age they will rapidly reset the area to a full stand, especially if slight assistance be rendered them in the removal of the denser stands of bush. Regeneration is good and a large area will, with proper protection, reforest itself.

In the past fires have rapidly burned over the division and consumed the older trees so completely that there remains no marketable fire killed timber.

About 1,500 acres are in a condition to be replanted at this time, requiring little or no labor for preparation. Norway pine and white pine are recommended for such replanting.

This division is at places very densely covered with rocks, estimated to cover more than 500 acres. Any replanting here would be done under much difficulty and large expense.

The waters on the reserve cover an area of about 50 acres, roads and trails 100 acres, and fire lines about 25 acres.

Springs and Streams.

There are a number of springs on the division, nearly all of which have been made accessible and posted so as to indicate their position. The springs almost without exception lower their flow in dry season, a fact which is attributed directly to lack of humus and forest floor cover. Replanting about the springs wherever practicable is one of the immediate problems to be met. The streams on the division are irregular in flow because of the irregularity of their source waters. Their flow is easily influenced by rainfall, showing that the catchment basin is badly in need of forest floor humus and a denser canopy. The character of this division is such that no contamination is likely to enter the waters.

Buildings and Repairs.

The headquarters of the forester and the buildings occupied by the rangers have been put into habitable condition and at present are entirely suitable for the purpose.

An old telephone line formerly used by the Tide Water Pipe Line Company runs from forester's headquarters to Slate Run, and passes over State land for a distance of $3\frac{1}{2}$ miles. The line was formerly

attached to trees, for which reason service was unsatisfactory. The trees are now gradually being replaced by poles and the service has correspondingly improved. The line of the Black Forest Rod and Gun Club connects with this line.

Roads.

The total length of public road on this division is 12 miles, in addition to which there are 9 miles of fire lanes. No road work was necessary during 1912 but three miles of repair work were completed in 1913.

Easements.

A 16-ft. wide right of way of the Tide Water Pipe Line Co. crosses this forest for a distance of 12 miles, following the Coudersport and Jersey Shore turnpike. The Gaines Pipe Line Co. has a 12-ft. right of way for a distance of $4\frac{1}{2}$ miles. These strips are kept free of brush and serve as good fire lines.

Plantations.

The following planting was done during 1913:

Red pine, 2-year,	1,000
Pitch pine, 2-year,	8,716
White pine,	20,100
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	29,816

This planting was accomplished in the reinforcement of a 12 acre tract near the Pump Station.

Labor.

As is usual in remote regions, labor is difficult to obtain because of lack of permanent employment and commands a high price. Twenty cents per hour is the ruling price for day labor, and 50 cents per hour for team work, or \$5.00 per day of ten hours. The leading industry in this region, lumbering, has practically ceased. There are a few farms in the neighborhood and these are small and easily managed by one man. The labor situation will continue to be unsatisfactory until the development of the forest proceeds to such a degree that labor may be employed the year round.

Market Conditions.

The principal market for material derived from the region is Williamsport, and is capable of consuming good timber of any kind, in any size. Hardwoods are preferred because demanded by the furniture industries in Williamsport, Montgomery, and Muncy. Prices, of course, are governed by market conditions and fluctuate here as elsewhere. Transportation is good and railroad rates are not excessive. The distance to Slate Run is so great, with a hard haul, that nothing but first class material may be taken out at a profit.

Fires.

One fire, covering one-half an acre, set by lightning, occurred during the year 1913, but none occurred in 1912. There is one observatory station in a pine tree. No trespass of any character came to the notice of the forester.

Outing and Recreation.

During the year 1912 there were 10 hunting camps and 12 fishing camps erected under permits upon this division. In 1913 there were 17 camps with 150 persons occupying them. Without exception, the campers conducted themselves well, and all took much interest in the development of the forest. During 1912 a number of pheasants were taken, but other small game was scarce. Twelve deer were reported as having been shot upon this division. In 1913 the number was 15. Ten bears and much small game were taken. The streams in this forest are well stocked with trout, and fishing is good. A number of fishermen took advantage of these conditions, making fine catches, several taking the limit in one day. The trout run to large size rather than small.

Permanent camp sites are numbered from 901 to 999 inclusive. 23 such sites have thus far been cleared and made usable.

4. THE BLACK FOREST, BLACKWELLS DIVISION.

Forester, John W. Keller, Lloyd.

Forest Rangers: Robert Thompson,* Morris.

Robert Schwab, Leetonia.

M. L. Fish,† Lloyd.

The Blackwells Division is located in Tioga and Lycoming counties.

The original boundary survey was nearly completed when additional purchases were made, leaving about 9,000 rods of surveyed line still to be run. All lines run have been painted and posted. Nearly 10 miles were brushed out in 1912 and 35 miles in 1913.

This State Forest contains 3 interior holdings, 2 of which it is expected will be offered to the Commonwealth for purchase. Four warrants forming a portion of this division are separated from the main body and should be joined up by the intervening purchases.

The present estimated area of the Blackwells Division is about 29,000 acres.

This forest has been completely lumbered and subsequently at different times burned. There remain no old woods and nearly the whole area is capable of improvement. A rather dense undergrowth of chestnut and oak is now appearing. Several tracts carry large growing timber. 200 acres will average a diameter of 16 inches in pitch pine, ten trees to the acre. 300 acres will average a diameter of 18 inches, carrying 12 trees to the acre of pitch pine and white pine. 6 acres of old hemlock will average 18 inches in diameter with 16 trees to the acre. 50 acres will average 16 inches in diameter, carrying 12 trees to the acre of beech, red, and white pine. 100 acres will average 14 inches in diameter, carrying 20 trees to the acre, with hardwoods, principally maple, beech, chestnut, and oak. A tract of 40 acres will average 14 inches in diameter, carrying 18 trees to the acre of mixed white pine, red pine, and hemlock. 100 acres will average 15 inches in diameter, carrying 12 trees to the acre of oak, white pine, and hemlock. 200 acres will average 18 inches in diameter, carrying 20 trees to the acre of hard maple and beech. This tract has been damaged by fire.

1,200 acres have a density of 50% or over, with an average diameter of not less than 3 inches. 12,000 acres are covered with coppice growth of chestnut and oak, which has sprung up since the fires of

*Resigned September 30, 1913.

†Began April 1, 1913.

1909 and 1911. 1,000 acres carry a density of from 10% to 50%, with an average diameter of about 5 inches. 11,000 acres of the same density is of less than 5 inches in diameter. 1,800 acres are covered with brush, where planting must be done. Rocks cover 450 acres, streams 100 acres, roads and trails 74 acres, fire lanes 32 acres.

Springs and Streams.

All the principal springs are marked on the map of the division. Original names are preserved as far as possible. 28 springs were repaired during 1913 and 6 made accessible by trails. All will be posted during the winter months. The springs located on heights are irregular; those in the valleys are regular. It is maintained in the neighborhood that the high springs never went dry until the fires burned the timber and the humus. Stream flow generally is irregular, with periods of great volume, alternating with almost no water during dry seasons. The tannery at Leetonia contaminates Cedar Run. The water is dark in color and offensive in odor. Drainage from the coal mines contaminates Wilson and Babb creeks. No fish can live in the latter streams, although trout have been caught in Cedar Run.

Buildings and Repairs.

The Brooks cabin was extensively repaired during April, 1913, and is now in a satisfactory condition. It is of great usefulness when working at a distance from headquarters. It is 16x22 feet in size with a kitchen 8x10 feet attached. It is fitted up with bunks and the necessary rough furniture and utensils. Spring house and stable are erected nearby. A fire lane surrounds the buildings. The whole cost for buildings and outfit is \$270.12.

A ranger's house and necessary out buildings were erected at Leetonia. Contract price for the buildings was \$2,564.00. The fitting up of the buildings with water and drainage systems, and charging in all the time of the forester and rangers, increased the cost \$446.04. The extra charge included the cost of the building fixtures, material and work for the barn, other out buildings, tearing down of old buildings, grading roads and walks.

A telephone line has been extended from Waterville to Blackwells. All work was done by the forest force at Slate Run. This line was then extended to the tannery at Leetonia. Necessary rights of way were secured and the line erected principally by the forester and his rangers. The total cost of the line was \$431.77, and its value will be many times the money spent upon it in the prevention of forest fire.

The Delmar and Hoytville Telephone Company's line supplies service to Blackwells, Morris, Stony Fork, and that portion of the State land east of Pine Creek. The service is good and the charge is reasonable. The Bell Telephone Company's lines reach Blackwells, Morris, Stony Fork, and Leetonia, but have no connection near to or within the State Forest.

Roads.

In 1912, the open road system within this area contained 28.5 miles of public roads easily traveled, 11.3 miles of fire lanes, 9.3 miles of boundary lines, and 3 miles of trails. In 1913, a new road from the State highway at the White farm to the Brooks cabin, somewhat over a mile in length, was the most important road work of the year. It opens up a portion of the division where considerable work will need to be done in the future. The difficulty in procuring labor prevented a greater road extension. The work consisted of making the survey, cutting brush, burning and removing the brush, dynamiting stumps, pulling out loose stumps, and grading with drag plow and road scraper. Additional road work consisted of brushing and rebrushing certain roads, covering a distance of 104.7 miles.

Easements.

A right of way 60 feet wide and 1,204 feet long was granted the Leetonia Railroad in 1912 over a portion of warrant 4,423 for a consideration of \$15.00 per year, and in November, 1913, a similar agreement for right of way was entered into with the Central Penna. Lumber Co. over tract 4,442, for a consideration of \$50.00 per year.

Mineral Prospects.

In 1912, permission was granted to Benjamin Vaughn to prospect for coal on Tannery Hill. The digging has reached a depth of 25 feet, but no coal has been discovered. No other minerals are being removed from State land and no other prospects are in progress.

Plantations.

To the end of the year 1912, 67 acres had been planted with seedlings, and one-fourth of an acre set with willow cuttings.

During the year 1912, planting was as follows:

2-year Old Seedlings.

European larch,	4,350	
Norway spruce,	2,000	
Pinus ponderosa,	2,000	
Scotch pine,	2,000	
Red oak,	6,000	16,350
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3-year Old Seedlings.

Norway spruce,	9,300
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3-year Old Transplants.

Norway spruce,	1,350	
White pine,	60,000	61,350
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Cuttings.

Willow,	5,000
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Total,	92,000

In 1913, 88 acres were planted with seedlings. To date forest planting on this division amounts to 155 acres. One-fourth of an acre was set with cuttings. The 1913 planting employed the following species:

European larch, 2-yr.,	1,000	
Norway spruce, 2-yr.,	49,500	
Norway spruce, 3-yr.,	14,491	
Red pine, 3-yr.,	21,780	
White pine, 2-yr.,	129,000	
White pine, 3-yr.,	8,790	
Pinus monticola, 3-yr.,	5,000	229,561
		<hr/>

The total number of seedlings planted to date is shown by the following table:

White pine,	248,890
Norway spruce,	76,641
European larch,	5,350
Scotch pine,	2,000
Pinus ponderosa,	2,000

Red oak,	21,000
Honey locust,	5,000
White ash,	500
Red pine,	21,780
Pinus monticola,	5,000
Willow cuttings,	10,000
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Total,	398,161

Sample Plots.

Three experimental plots were set out in 1912, using *Pinus ponderosa*, Scotch pine, and European larch. A plantation of silver pine was made in the spring of 1913. An experiment by alternating species has been tried out, using white pine alternating with red pine and silver pine. A small plantation of white pine, alternating with red oak was started in 1912. An experiment to determine the value of fall planting in this region was also made and will be reported upon later.

Labor.

Labor costs 17½c. per hour to September 1st. After that date 14c. per hour and board is the price paid. Teams with driver are worth 40c.; for one horse and driver 27½c. Labor is good in quality but is constantly on the lookout for higher wages. A strike for more money occurred at the end of May, 1913, but all came back voluntarily without advance.

Market Conditions.

There is not much salable material derivable from this forest at the present time. Sales have been limited to fence posts and a few thousand feet of logs and fire wood. Transportation facilities are good and the railroad rates satisfactory. There are no nearby wood-using industries and the scattered material which might be worked up by them under present conditions cannot be removed at a profit. With no nearby market, a minimum of returns from this forest must be expected for the near future.

Erosion.

The surface of this particular forest is such that erosion readily begins. After the removal of the virgin timber and the repeated burning of the surface, little protective vegetation remained on the hill-sides. Erosion naturally followed and is continuing, exposing the

rocks. Much of the soil from the steepest hills has been washed to lower levels. Nothing but good forest cover and the prevention of fire will operate to check this waste. Stream banks are undermined and carried away. The shrubby growth is not sufficient to hold the bank.

Insects and Fungi.

The work of the white pine weevil has been noticed sparingly, but to date the weevil has not entered the white pine plantations. Occasionally white pine trees are found affected with the white pine blight. One chestnut tree was discovered attacked by the chestnut blight. This tree was promptly cut and burned and no recurrence of the disease has been found. The trembling aspen is attacked by the streaked cottonwood leaf beetle.

Forest Fires.

One fire occurred in May, 1912, covering an area of 100 acres on State land. 60% of the growth was killed and the forest floor cover destroyed. In June a small fire covering 2 acres occurred on private land killing 75% of the growth. Both fires are believed to have started from the New York Central Railroad. During 1913, fires on State land numbered 6, burning an area of 235 acres, and on nearby private land they were 5 in number. The forest force assisted in extinguishing fires on private land. Half the fires are attributable to railroads. The remainder are distributed among various causes. One observatory station was built on West Hill, using a large red oak. A view from this tree may be had over the larger part of the division. The expense was \$4.95.

Outing and Recreation.

Eleven permits to camp were issued to 65 persons during 1912. Eight deer and five bears were reported killed on or near the reserve. Twelve permits were granted to 72 persons for camping within the forest in 1913. Nearly all permits go to hunting parties. Three deer and three bears were reported killed on or near State land. Many pheasants were taken. Fishing is not good in the region. The trout streams are not well stocked and cannot be kept stocked until the forest growth along the banks of the streams covers the water and keeps the pools dark and cool. For this reason few fishermen encamped within this forest. All camp sites on this division will be numbered from 1,001 to 1,099 inclusive. Thirteen camp sites are in good order, cleaned, and posted. Nine others are not yet posted and

numbered, but are suitable for camping purposes. These sites are at present known only by the old incongruous names which are to be replaced by proper designations in the near future.

Lightning Report.

But two lightning strokes are reported during 1913, one in July and one in September, respectively in pitch pine and white pine.

5. THE BLACK FOREST, SLATE RUN DIVISION.

Forester, Frank D. Jerald, Slate Run.

Forest Rangers: M. E. Westcott,* Slate Run.

O. M. Campbell, Cammal.

Work on this division was confined principally to tree planting and road building. New roads were constructed and old roads brushed out and repaired to an extent in excess of 20 miles, while over 19 miles of trails received the same treatment. The road work was confined to a grade on the Trout Run road, the Narrow Gauge road, the Big Trail, the Slate Run grade, and what is known as the mountain road. The trail work was carried through Stradley hollow, Campbell hollow, Second, Third, and Fourth hollows, the Quarry trail, the Miller trail, Slide hollow, Trestle fill, Gas Line, and trails known as Nos. 1, 2, 3, and 4. Roads were opened to a width of from 16 to 20 feet, trails about 10 feet. The mountain road, because of its character, was opened only to a width of 12 feet. The total number of miles of road at present opened and repaired within this forest is 26, and there are 20 miles of trails and 4 miles of fire lines. The boundary survey of this forest is now complete with the exception of one small tract. The boundary lines have not yet been opened.

Springs and Streams.

All springs along fire lines and roads are cleaned and many posted. The flow is regular and free from contamination.

*Resigned September 30, 1913.

Buildings and Repairs.

There are no buildings on this division except the small cabins left by the lumbermen. They are insufficient for State purposes and not properly located. The telephone line recently constructed is giving good service.

Plantations.

Eight pounds of coniferous tree seeds were sown in plantations during 1912, and of the following species:

Norway spruce,	3 pounds.
Red pine,	2 pounds.
White pine,	2 pounds.
Scotch pine,	$\frac{1}{2}$ pound.
Douglas fir,	$\frac{1}{2}$ pound.

Total,	8 pounds.
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Young trees, both seedlings and transplants, to the number of 41,000 were used in reinforcing 33 acres, as follows:

Seedlings.

Norway spruce,	5,000	
Honey locust,	1,000	
Red oak,	20,000	26,000

Transplants.

White pine, 3-yr.,	15,000	41,000
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The above reinforced planting was made on the James Wilson warrant No. 4240 and the William Perry No. 10.

Minerals.

All the table lands at the headwaters of Slate Run contain beds of clay. Some of it is believed to be good fire clay.

Labor.

As elsewhere throughout the State Forests, labor conditions are unsatisfactory. Good men are scarce. Labor costs from 18c. to 22c. per hour. Team hire from 40c. to 45c. per hour.

Erosion.

Erosion is at a minimum. It is very rare to see Slate Run discolored.

Fires.

From July 8th to July 15th, 1912, a severe fire occurred in McHenry township covering about 800 acres of State land. All small material on the burned area was destroyed and the humus on the forest floor burned out. The origin of the fire is not know but it is believed to have originated from a stroke of lightning. The cost to extinguish it amounted to \$210.65. Only two small fires occurred on the division during 1913, burning not more than one-fourth of an acre.

Markets.

A considerable amount of dead, down, and otherwise worthless material so far as its presence in the forest was concerned, was disposed of during the year as follows:

Compartment.	Area.	Board feet.	Total receipts.	Net receipts per acre.
	Acres.			
William Perry, No. 10,	400	156,177	\$479 82	\$1 80
William Perry, No. 8,	400	79,137	257 49	66
Warrant No. 2655,	1,000	21,070	27 10	02
James D. Wilson,	440	8,610	8 61	02

Attention is called to the above financial return from the 400 acre tract of William Perry No. 10. The price paid for this area was \$2.00 per acre and the receipts therefrom in one year from material of poor quality, and which is better out of the woods than in it, amount, as above shown, to \$1.80 per acre. Almost innumerable tracts, both in this forest and elsewhere, contain similar material, which, if it could be made accessible by a system of road building and thus more easily removed to the market, would produce financial returns of equal or greater value. A return of 90% on the investment as here shown, derived from material better out of the forest than in it, is a mild indication of the possibilities of practical forestry, when, after a sufficient lapse of time, there is ample good material with which to work.

Outing and Recreation.

All camp sites on this division will be designated by numbers 1,101 to 1,199 inclusive. Camping parties behave themselves generally well, but there was more drinking and carousing on the part of the campers than is good for their personal reputations. Eight deer and six bears were reported taken and a large amount of small game. Fishing is good in Slate Run and large numbers of trout were taken. The prize trout weighed $5\frac{1}{2}$ pounds and was $23\frac{1}{2}$ inches long.

Lightning Report.

The following trees were struck and shattered in 1912:

	July.	August.	Total.
Chestnut,	14	2	16
Chestnut oak,	9	2	11
Pitch pine,	22	12	34
Hemlock,	2	2	4
Total,			65

During the month of August a dead hemlock was struck and ignited. The tree was completely burned up, but no fire was communicated to the forest because of the damp condition of the floor.

21 trees were struck and shattered and 4 were ignited in 1913. The occurrence was as follows:

August,	24
September,	1

The species struck were:

Rock oak,	8
Jack pine,	9
Chestnut,	4
Hemlock,	4

6. THE BLACK FOREST WATERVILLE DIVISION.

Forester, Horace C. Evans, Waterville.

Forest Rangers: S. H. Lebo, Lucullus.

G. C. Spiegel,* Waterville.

L. W. Rogers,† Waterville.

The Waterville Division of the Black Forest comprises three ranges, Waterville, Cammal, and Little Pine Creek, the last being divided into two sub-divisions, the Okome and the East Hill. Ranger Spiegel had charge of the Waterville range, Rangers Campbell and Lebo of the Cammal range, and Ranger Rogers of the north end of Little Pine Creek.

The greater portion of this State Forest lies within Lycoming county. A part extends into Clinton county near Haneyville.

The added tracts are not included in the boundary survey. All present surveyed lines are marked and painted. The timber in the Little Pine Creek region is hypermature over an extent of 400 acres, and will yield more than a half million feet. The balance of the division contains scattered mature growth which would yield many hundred cords of mine props. For the present it is needed as a cover. A coppice regeneration of good quality is being produced. Where protection is afforded natural regeneration is proceeding.

Springs and Streams.

The springs and streams in this forest are in good condition, although some are still subject to periods of high and low water. All springs near roads and fire lines have been cleaned and deepened. The water is pure and cold wherever the ground is well shaded. Some of the smaller streams in the gorges have sunken beneath the surface. Deforestation and fire have noticeably affected the flow of Pine Creek. Acid plants discharge refuse into the head of this stream.

Buildings and Repairs.

The buildings owned by the State are in good condition. The barn on the property occupied by Ranger Lebo was repaired during 1913. The house was repaired during 1912 by a general overhauling, and is now in a habitable state.

*Resigned April 30, 1913.

†Began September 1, 1912.

The forester began the construction of a telephone system to connect his headquarters with his rangers and the immediate neighborhood. A line of metallic circuit has been built from Waterville to Blackwells. The line from Cammal to Ranger Lebo's has been converted into metallic circuit. It was constructed under the supervision of the foresters by untrained men. An additional branch has been run to the Pump Station. The forest telephone system in this region now is 46 miles in length, and communicates over an area of 182 square miles, reaching four foresters, three rangers, and five other persons. Switch connections are made at Waterville with the Brookside and White Pine Co.

Roads.

Work on the forest roads, fire lanes, and trails was pushed vigorously during 1912. On the Waterville division 2.7 miles of fire road were completed. The fire roads are the ordinary fire lane, so built that they may be used by teams. On the Cammal division 4.5 miles of lane and trail were completed and on the Little Pine Creek division 6 miles of fire road and $1\frac{1}{2}$ miles of fire lane. The road begun in 1911 up Trout Run in the Cammal and Little Pine Creek divisions, was completed over a total distance of about 9 miles. Three miles of additional road lying in both of these divisions, known as the School House and Hollow roads, have also been built.

The total road building during 1912 amounts to 33 miles. In 1913 the same roads were improved and additional new work completed. Road work in 1913 covered 67.3 miles.

Minerals.

The mineral resources of this forest are not yet well developed. Soft coal has been mined in the basin of Little Pine Creek for the use of the English Center tannery, and the promise there for further mining seems to be good. On East Hill range east of Little Pine Creek, a 25-foot bed of fire clay is found 16 feet below the surface. The bed of fire clay also exists west of Big Pine Creek along the Coudersport pike. Limestone has been found near Haneyville.

A vein of iron ore in the State Forest near Haneyville is known to have been mined as early as 1825, and iron therefrom manufactured in the locality. The walls of an old furnace are still seen. The vein seems to be upwards of 3 miles wide and lies close to the surface, following the mountain ridge along Coudersport pike. A forge was formerly in operation at Jersey Shore.

A good grade of flagstone is found on the slopes of Pine Creek and its tributaries. This is rather extensively quarried and is the only present local industry. This stone is hard and of good quality for building and road purposes.

Plantations.

The total area to date planted on this forest is 64.6 acres. 21 acres have been planted by using seed in spot planting.

The seedling trees by species thus far planted, are as follows:

White pine,	115,500
Norway spruce,	15,000
Pinus ponderosa,	2,000
European larch,	2,250
Scotch pine,	4,500
White ash,	11,000
Red oak,	50
Chestnut,	50
Honey locust,	6,325
Red elm,	19,000
Willow cuttings,	500
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Total,	176,175

During 1912 planting was as follows:

Broad leaf trees.

Elm, 2-yr.,	3,800
Honey locust,	1,650

Conifers.

Pinus ponderosa, 2-yr.,	2,000
White pine, 3-yr.,	19,000
Norway spruce, 3-yr.,	15,000
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Total,	41,450

Sample Plots.

Two experimental plantations were formed in the spring of 1912 with *Pinus ponderosa*. 1,000 plants in each were set out in a mixture of elm and others, planted solidly. The first is on a sandy shale mountain plateau, and the second on sandy clay. Seedlings in both plantations appear to be thriving.

Labor.

The price of labor in this region is high and men are scarce. The best labor demands from 20c. to 25c. per hour in the quarries, and it is difficult to get good men for less than 18c. A team with driver costs 40c. per hour. This scarcity of labor is due to the exhaustion of the lumber supply, and for the high cost of work within this forest. A small supply was had at 18c. per hour but this rate cannot be maintained in the future.

Improvement Cutting and Markets.

Improvement cutting consists of the removal of fire damaged timber from the Waterville division. Silas Hostrander is working over 1,000 acres near Okome. For such material a price on the stump of from \$1.00 to \$4.00 per thousand feet is received, and ten cents each for ties. The distance from market, the poor quality of material, and the scarcity of labor make improvement cutting by the Department too expensive. There is little local demand for fuel. Extract wood is worth \$4.00 per cord delivered. Mine plank 6 feet long, with a minimum thickness of 1½ inches are worth \$18.00 per thousand. Mine props according to size and quality are worth \$2.50 to \$3.50 per ton. Hemlock and pine lumber are worth delivered from \$16.00 to \$22.00 per thousand feet. Chestnut telephone poles from \$1.50 to \$6.00 each delivered. A 30-foot pole 33 inches in circumference 6 feet from the base and 21 inches in circumference at the top is worth \$1.50. Pitch pine mine props are in demand. There is much of this material on the mountain ridges but it costs too much to remove it. The railroad rate from Waterville to neighboring market is \$1.30 per ton. 705 telephone poles were cut and delivered within the forest for the building of the administration telephone lines.

Growth.

The forest growth in this region is coppice, ranging in age from 1 to 12 years. It consists of broad leaf species with a scattering of pitch pine and a few white pine and hemlock. There is at present on the ridges at least 1,000 cars of prop timber and considerable lumber and dimension stuff, but with present market prices and distance from the market, it would not be advisable to remove this uneven-aged forest cover, although such removal would be a benefit to the even-aged undergrowth. Natural reforestation will proceed satisfactorily with protection. There have been some severe fires on the three divisions during the last four years.

The 7,300 acre East Hill range of the Okome sub-division contain 3,000 acres of a fine natural regeneration of chestnut and oak coppice. Protection from fire will go a long way in the quick reforestation of a large part of the area, although planting must be resorted to at places. Natural regeneration is uneven and therefore unsatisfactory. Planting with species of rapid growth produces by far the most satisfactory results. Pine, larch, and elm are recommended for planting in this forest.

Erosion.

In past years erosion was severe, but with the growth of coppice underbrush it is gradually decreasing and is now not the problem it was formerly. With the restoration of a good forest cover it is hoped that erosion will be entirely prevented.

Insect Attacks and Fungous Diseases.

The white pine weevil is the most destructive insect in this locality. A scarcity of white pine, however, has produced a minimum of loss. The chestnut bark disease is now attacking vigorously. Many infected trees have been found and destroyed. This invasion began in 1913.

Fires.

During 1912, about 250 acres of State Forest were burned. The fire wardens are generally prompt, although fires are difficult to extinguish in the mountain thickets. Continual watchfulness is necessary and continuous daily patrol during the fire season is the only thing that will produce satisfactory results. The forest rangers are cooperating with the local fire wardens and with the best possible results.

An observatory has been erected on private land 2 miles from Waterville from which the whole of the Waterville and Little Pine Creek divisions may be seen, and considerable private land besides. The town of Cammal, 10 miles away, is within view, and the Nippenose mountains at Jersey Shore. This observatory commands a radius of about 10 miles. One other observatory is needed in Ranger Rogers' locality, and practically the whole forest could then be guarded.

During 1913 four fires covering 1,300 acres of State land occurred. A second observation tower was built.

Trespass.

Violations of the forest laws are uncommon and usually of a trifling character. Some trouble is experienced from the over-grazing of

cattle. A few unauthorized camp fires were discovered during the hunting season, and those building them were requested to observe the rule in the future. The fish and game laws are more frequently violated. When violations are discovered the forest officers report the cases to the respective Department, having control of fish and game. In 1913, seven dead does were found in the woods following the hunting season. The trespass case of Burkholder is reported upon elsewhere.

Outing and Recreation.

This forest is a favorite region for hunters, and 10 camps were erected during 1912. All were visited by the forest officers and found to be in good order. 40 deer were reported killed either on or in the neighborhood of the State Forest. Eight camps were erected during 1913 and 50 deer taken. Ruffed grouse were numerous. Trout are not abundant, although many fishermen visit the streams. Due to a lack of forest cover, the streams are not sufficiently well protected. A number of excellent camping sites exist. All camp sites on this division will be named and numbered from 1,201 to 1,299 inclusive. They are now being developed. Many persons from the nearby cities and towns take advantage of a short stay in the State Forest. With the development and opening of the woods, outing and recreation parties will increase in number.

The schools of the neighborhood are availing themselves of the privilege of going into the State woods. Arbor Day work is being encouraged. The forester and his rangers interest the school children in this work as far as possible. Whenever forest work is explained to the children, they are interested. Nature study has recently received an impetus through the interest of those in authority.

Lightning Report.

During 1912, the following indicates the frequency of the electrical storms, during which the following trees were struck and shattered:

	June.	July.	September.	Total.
Hemlock,	1	1	3	5
Chestnut,	1	1	.....	2
Pitch pine, .....	.....	1	.....	1
Rock oak,	1	.....	.....	1
Red oak, .....	.....	1	.....	1
Total, .....	.....	.....	.....	10

In July, one tree, a chestnut, was struck and ignited.

One of the hemlocks struck in September was hit about 30 feet from the ground and the top split. Several of the neighboring trees felt the influence.

During 1913, 58 lightning strokes are reported, as follows:

June,	18
July	20
August,	15
September,	4
October,	1
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	58

One tree, a hemlock, was struck and ignited and burned for several days before it was discovered. With respect to the degree of frequency, the species struck were as follows:

Pine,	28
Chestnut,	11
Hemlock,	8
Rock oak,	6
White oak,	5
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	58

7. THE BUCHANAN FOREST.

Forester, Alfred E. Rupp, Fort Loudon.

Forest Rangers: J. V. Carlin, Metal

Harry A. Reitz,* Chambersburg No. 6.

The Buchanan State Forest is made up of the Aughwick and Bear Valley divisions, each of which is patrolled by one of the rangers. The former division contains 6,760 acres, the latter 4,319. The boundary line of this forest has been completely surveyed and the lines are marked, posted, and painted. At places they are used for fire lanes and trails. All corners are well built and witnessed.

The region has been lumbered over at different times and now contains but 25 acres of virgin forest. A number of mature and hyper-

*Left service April 30, 1913.

mature trees are scattered throughout the area, but these may be removed only with profit along with other dead or fallen trees. There is a market for this material as cord wood and pulp wood. About one-half of the forest at this time would yield two cords to the acre. Natural regeneration is sufficiently good to replace all removals. Of the whole forest, about 3,000 acres have a density of 50% or over. About half of this needs strengthening, while the remainder is being strengthened by natural regeneration. About 5,300 acres are covered with a stand having a density of from 10% to 50%. The species are rock oak, chestnut, pitch pine, red oak, hickory, and maple. The removal of the inferior part of the present stand would improve the regeneration. The product would be cord wood, pulp wood, and chemical wood, which may be handled at a profit by using men in regular employ. There are small areas in the above portion which may be strengthened by under-planting after the removal of the dead and down timber. At least 2,000 acres of this forest are covered with scrub oak and worthless brush. About one-half of this will produce some natural regeneration, but no valuable species are found on the remainder.

An area of about 50 acres of open space may be planted rather easily with seedling trees. 500 acres are covered with rocks with many steep slopes. Little can be done here except to prevent fire which will permit a more or less dense brush cover to be used in the formation of forest humus. 26 acres are included in the beds of streams, 33.5 acres are used for roads and trails, and 38.5 acres for fire lanes. On at least half this reserve artificial regeneration is best postponed for the present because of the too great expense in preparation and planting. Pitch pine is reclaiming some of the weed area. Some white pine trees are now restocking the areas in their neighborhood.

Springs and Streams.

All well located springs have been cleaned and made accessible. The most important ones are walled. Where possible, fire lanes are laid out near them. Where the forest floor humus is in good condition, the springs flow regularly throughout the year. Where the humus is not intact, the flow is irregular. Stream flow in the Aughwick creek is regular, but is less regular in the Bear Valley stream, where it is subject to floods and droughts.

A source of spring and stream contamination still exists in the neighborhood of the old saw mill sites, where refuse, saw dust, and other debris are still abundant. It would conduce to a better condition of things were all this refuse burned.

Buildings and Repairs.

The buildings in the forest form a home for a ranger, and are in good condition.

A good trunk line telephone service is at hand and a private line $7\frac{1}{2}$ miles long has been erected by the Department between the forester's headquarters at Fort Loudon and the ranger's home at Cowan's Gap. The rates charged by local companies are a dollar per month with good service. Each subscriber owns his own telephone.

Roads.

All old roads have been repaired and improvements made in both valleys. They need further improvement by reason of the grades. These two roads are located each between two mountains and are the leading roads to all part of the forest. A new road is needed from Path Valley to the top of Tuscarora mountain through Cowan's Gap. The old road in this region is in bad condition with grades too steep. During 1912 about 8 miles of roads were repaired and improved. In 1913, road work, including trails and fire lines, covered a length of 56 miles.

The Buchanan Monument.

The site was cleaned of brush and briars and the land drained for tree planting. A walk was made between the road and the monument and the fence around the monument painted. The spring is cleaned and walled. Improvement cuttings were made in the nearby woods. Within the inclosure 3,100 Norway spruce, 2-2 yr., were planted.

Plantations.

Spot plantings were made in 1912 in a 5-acre plot using two pounds of white pine, and in a 3-acre plot using one-half pound of Scotch pine and one pound of Norway spruce.

The following seedling trees were planted:

Norway spruce,	3,000
White pine,	2,030
White ash,	1,300
Red oak,	3,500
American elm,	100
Willow cuttings,	2,000
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Total,	11,930

All plantations were made 4x4 feet and the growth has been uniformly satisfactory.

Plantings during the year 1913 were as follows:

Red oak acorns,	1 bushel
Norway spruce, 2-yr.,	15,000
Norway spruce, 2-2-yr.,	11,200
White pine, 2-1-yr.,	10,000
White ash, 1-yr.,	4,000
Black walnut, 1-yr.,	635
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Total,	40,835

Seeds and seedlings planted to date are as follows:

Seeds.

White pine,	2 pounds.
Scotch pine,	$\frac{1}{2}$ pound.
Norway spruce,	1 pound.
Red oak,	1 bushel.

Seedlings.

White pine,	27,930
Scotch pine,	5,800
Walnut,	2,197
Red oak,	3,500
Norway spruce,	57,010
Catalpa,	363
Balsam fir,	200
American elm,	100
White ash,.. ..	9,300
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Total,	106,400

Nurseries.

A small nursery was established at Metal for this forest in May, 1908. It contained only one-fifth of an acre. Many of the seedlings planted, as above, came from this nursery. The stock in the nursery at the end of 1912 was 11,400 4-year old Norway spruce transplants and 635 1-year old black walnut. Because of the too great expense of raising seedlings in this nursery, it was abandoned in 1913.

Sample Plots.

Three sample plots have been located. The area of each plot is one acre and the object is to determine the volume and rate of growth for

15—26—1915

trees in this forest. No data or measurements can be submitted at this time.

Labor.

The wage scale for labor is 15c. to 16c. per hour. For a team including the driver, it varied from 37½c. to 40c. per hour in 1912. Laborers are abundant in the spring, but nearly all are employed during the months of June and July. Competition is rather keen with the farmers and the State Highway work. All forest operations must be started early in order to hold good men, or pay a higher price for inferior men.

Improvement Cuttings.

No improvement cuttings have been attempted in this forest except those necessary in laying out the sample plots which were made by the probationary forest students.

Markets.

There is no demand for unfinished lumber. Cord wood is used locally and bark by the Mercersburg tannery. Railroad ties are called for by the local line. Sawed lumber is produced for car stuff, building material, furniture, and bridge timber. Oak and white pine are the principal saw timbers. Transportation facilities are poor on the mountain but good in the valley. The distance is too great to the railroad for a profitable operation. When delivered, the railroad facilities are excellent. The rates are reasonable and service is good. There is little home market at this time for State grown wood. All lumber and dimension stuff go to outside markets. For this reason the Department must control the means of hauling. Otherwise, sales cannot be made at a profit.

The price for cord wood varies from \$2.50 to \$2.75 delivered. The following prices have been ruling for other material:

Building lumber, mixed oak and chestnut, \$20.00 per thousand.

Car timber, mixed oak and chestnut, \$18.00 to \$20.00 per thousand.

Wagon wood, mixed oak and chestnut, \$25.00 per thousand.

Ties, rock oak and white oak, 68 c.

Ties, chestnut, 45c.

Locust wood and insulator pins, \$8.50 per cord.

Bark, rock oak, \$8.00 per ton.

All the above prices are for material delivered. The railroad rate for cord wood is 45c. a ton for a 12-mile haul. Other rates are reasonable.

Erosion.

Considerable erosion is found on the roads, trails, and fire lanes, caused by the steep grades. The prevention of erosion is one of the objects aimed for in road work.

Insects and Fungi.

The white pine weevil is present and is doing some damage to the natural regeneration of that species. The chestnut bark disease is found scattered over the entire forest. The effort to locate and destroy it has met with marked success. Constant vigilance is required to keep it in check. All infections, when located, are destroyed.

Forest Fires.

During 1912 no fires occurred within the State Forest. Local fires aggregating 91 acres were all confined to private land. The forest force attacked them immediately when seen and prevented their reaching State land.

There were no fires in the Buchanan forest during 1913. Local employes are using more care with respect to fire in the woods. Local population is cooperating in fire prevention. One observatory station was built with telephone line running to it. Fires on private lands nearby covered over 1,200 acres.

Outing and Recreation.

The only persons who camped within the State Forest during 1912 were hunters, 5 camps containing 35 members. The conduct of 31 of the number was all that could be desired, but of the remaining 4 the same statement cannot be made. These 4 persons, who held permit 396, refused to report to the forester, and a question has arisen whether or not they did not violate both the game laws and the forest laws.

The products of the hunt so far as reported were 13 deer, 30 turkeys, and a considerable quantity of small game, all taken on or near the State Forest.

All campers during 1913 were hunters. 7 permits were issued but only two used. 20 hunters entered the camps. Their conduct was excellent throughout. 4 deer were killed within the State Forest and 3 on adjacent land. One doe was killed and sent to the Chambersburg hospital. Much small game was taken.

The fishing is poor. The streams need restocking and the protection of better growth to darken the pools.

All camp sites within this forest will be numbered from 1301 to 1399 inclusive. 9 thus far have been permanently located and marked. Many persons use the State land for outing and recreation from day to day. The boy scouts have made use of the State Forest when camping in the vicinity.

Lightning Report.

Trees struck and shattered in 1912:

	May.	June.	July.	August.	September.	October.	Total.
Chestnut oak,		3	1			2	6
White pine,	1			1			2
Pitch pine,		2					2
Red oak,		1	1		1		3
White oak,	2		2				4
Hemlock,	1						1
Total,							18

Only one tree during this year was ignited by the current, a chestnut oak during the month of March.

It was observed that trees located both on top of the mountain and in the lower altitudes were struck. Some of those struck were the smallest in the group. In one instance one bolt hit 4 trees.

Trees struck and shattered during 1913 were,	29
Trees struck and ignited,	1
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	30

Periods of frequency are as follows:

June,	3
July,	13
August,	14

The tree species struck were:

Chestnut oak,	3
Red oak,	3
White oak,	1
Chestnut,	5
Yellow pine,	9
White pine,	5
Hemlock,	2

Hickory,	1
Locust,	1
	<hr/>
	30

One yellow pine was ignited and caused a forest fire on Cove mountain. The kind and height of tree in these woods seem to have little to do with the lightning strokes. Bolts have hit the ground near large trees. Small trees are struck in the neighborhood of tall trees. A chestnut tree completely shaded by other trees was struck near the ranger's headquarters.

8. THE CLEARFIELD FOREST, CLEARFIELD DIVISION.

Forester, William F. Dague, Clearfield.

Forest Ranger, John Nelson, Clearfield.

The Clearfield Division of this State Forest is nearly a compact body of land, broken only by two interior tracts, one belonging to the Chase Estate and the other to the Crystal Spring Rod and Gun Club. A portion of the area contains a fair growth of chestnut, oak, and maple, which at present needs little attention. A large portion of this forest land contains no valuable tree cover, but only brush, bracken, briars, sumach, bird cherry, and quaking aspen. The soil here is good but needs to be cleared and planted. Natural regeneration would probably restore about half the area. The balance must be planted artificially. The burned-over areas could be prepared for planting at small cost. A scattered growth of jack pine amounting to about 500,000 board feet on two of the compartments is declining and is gradually being removed at a profit of from \$3.50 to \$8.00 per thousand. The boundary survey is now completed.

Springs and Streams.

Two of the springs within this area were given special attention during 1912. The Rager spring along the Penfield road, one-fourth of a mile south of the Smith place, was walled up, cemented, and drain placed to carry water for the use of horses to a watering trough below the spring. The mill spring at the ranger's dwelling was thoroughly cleaned and a concrete wall 3 feet high was built around it. A

cistern 8x6x6 was constructed as a reservoir at 11.4 feet below the spring. Water from the cistern is conveyed to the ranger's house.

The springs had a strong and satisfactory flow and none of the main springs failed during the dry months. During 1908 the Smith spring failed. The Weilder spring failed in 1908, 1909, 1910, and 1911. The Horn Shanty spring failed in 1908, and 1911, and the Bloody spring failed in 1908, 1910, and 1911, but all had a strong flow during the year 1912.

All main springs were dug out and made accessible during 1913. Sign boards have been placed, naming and locating the principal springs. A watering trough was placed upon the Penfield road at Bloody Spring. It serves as a water supply also in case of fire. Clearfield and DuBois receive their water supply from State lands. There is no contamination.

Buildings and Repairs.

The ranger's residence is located near the Bloody Spring. Several necessary outbuildings were built during 1912.

A water system was built for conveying water from the Mill spring to the ranger's house. Necessary fencing was erected and 4 acres of land around the buildings cleared for the purpose of cultivation.

The telephone line from Penfield was extended so as to connect Ranger Johnston on that division with Ranger Nelson on this. The distance was somewhat in excess of two miles. It is intended to extend the line to Clearfield by way of the Smith place and the Horn Shanty. A suitable house for shelter and general reserve purposes is needed at the Horn Shanty. The next large area of planting ought to be made in this region. In 1913, a blacksmith shop was built at the Bloody Spring. The Gordon camp was repaired for Ranger Bennett. Some repairs were begun but not finished at the spring house at Bloody Spring. The stumps on DuBois field around the ranger's residence were blasted, piled, and burned. The telephone system is about being extended from the ranger's house at Bloody Spring to the Horn Shanty. The poles are cut and skidded.

Roads.

During the year 1912 road work was continued, which consisted mostly of removing stones, cutting and mowing brush, building bridges and fording places. A large part of this work was done by the forester and his ranger. In compartment 1, work was done on the Nelson and Hoover roads. In compartment 2, on the Sand Spring, Sinnemahoning, Shingle Mill, Crystal Spring, and Lick Run roads.

In compartment 3, on the Penfield, Dubec, Weilder, Weilder Trail, Smith Ridge, and Gordon Camp roads. In compartment 4, on Fire Break, Schoefield, and Kelley's roads, and Jury Trail. The total distance thus covered was 48 miles. The same distance was again traversed in 1913.

Easements.

The Clearfield and DuBois Water Companies receive water flowing from the State Forest for municipal purposes.

Minerals.

Good building stone abounds. Soft coal and fire clay also are present. The distance from markets lends little value to it at this time.

Plantations.

A plantation of 21 acres in compartment 3 was made in the spring of 1912, using 10,000 2-year seedlings and 40,000 3-year seedlings. The soil was cleared of logs and brush and refuse burned. The planting was spaced 4 ft. x 4 ft.

50 acres additional land were planted during 1913. A partial clearing preceded the planting, which was in the neighborhood of the Bloody Spring. 115,000 two-year old seedlings were received from the Asaph nursery; 15,000 two-year old Norway spruce, and 1,000 European larch were taken from the reserve nursery and planted on the above tract.

Planting to date is, therefore, as follows:

White pine,	165,000
Norway spruce,	15,000
European larch,	1,000
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	181,000

Nurseries.

In the smaller nursery connected with this forest, the following seeds were planted in 1912:

Norway spruce,	5 pounds.
Red pine,	5 pounds.
White pine,	25 pounds.
Scotch pine,	2 pounds.
Douglas fir,	3 pounds
Black cherry,	8 quarts.

In 1913, it was enlarged to two-fifths of an acre, containing 124 beds, 54 ft. x 4 ft. The following seeds were sown:

White pine,	20 pounds.
Norway spruce,	20 pounds.
European larch,	10 pounds.

Inventory of stock on hand in the fall showed the following:

Red pine, .....2 years,....	80,000
White pine, .....2 years,....	205,000
Douglas spruce, .....2 years,....	8,000
Norway spruce, .....2 years,....	35,000
White pine, .....1 year,....	135,000
European larch, .....1 year,....	100,000
Norway spruce, .....1 year,....	437,000

The nursery possesses about everything it requires except a water system.

Labor.

Labor is scarce and expensive. Wages for a good laboring man are \$1.75 per day of 10 hours. As high as \$2.25 per day is occasionally paid. At the price the State is permitted to pay for fighting fire, it is impossible to procure men voluntarily to do this work. Teams cost 40 cents per hour.

Improvement Cuttings.

A small improvement cutting was made in 1912 at the DuBois field in the white pine growth of about 30 years, the trees ranging from 30 to 40 feet in height. Fire had injured them and they were dying. All dead trees were removed along with the dead branches of the others. Other trees of no commercial value were removed and burned. The color and leafage of the remaining trees have improved.

In 1913, this was continued with the removal of the dead and dying jack pine. 215,000 board feet of jack pine, 30,905 feet of chestnut were sawed into building material. It cost \$11.50 per thousand. The chestnut yielded \$17.00 per thousand and the jack pine \$20.00. A considerable quantity remains on hand.

Insects and Fungi.

No attacks of any importance have been made either by insects or fungi. The chestnut bark disease was discovered at one point in the forest and promptly destroyed, and has not since reappeared.

Markets.

The local market is good for building lumber, paying anywhere from \$15.00 to \$30.00 per thousand feet. The demand is diminishing. Prices for lumber for mine purposes are so low that no profit could be yielded.

Forest Fires.

During 1912 no fires occurred within this State Forest. Four fires occurred on State land or in its immediate neighborhood during 1913. 1150 acres of State land were run over. The origin of the fire is unknown in every instance. A lookout tower 50 feet high was built on the range between Bloody Spring and the Smith place. It commands a wide view, is substantial, and was built by the forester and the rangers. The cost was only \$15.00.

Outing and Recreation.

For the purpose of berry picking, fishing, and hunting, 160 persons camped within the forest during 1912. All conducted themselves properly and no violation of the rules is known. The frosts in May injured the berry crop and for this reason it was meagre compared with other seasons. The year showed a decrease in the number of deer hunters, while those for small game increased. Eight deer were shot on the reserve during the season. Fishing is poor owing to the droughts of 1908 and 1910. Streams were below their average flow. All springs and streams seriously need planting along their banks and for a distance around their headwaters, in order to furnish proper forest flow conditions. If the streams could be supplied with a forest canopy, this would furnish substantial help in keeping the pools dark and cool. The planting of young fish could then be successfully carried on.

In 1913, at least 150 persons camped within the forest and more than 200 hunters were present for a day at a time. Deer were abundant and 15 were taken within the State Forest. Small game is scarce, due no doubt to fire. Small game hunters increased in number. Streams are being restocked and fishing should improve within a few years.

This forest abounds in good camp sites, at least 20 in number, and are located on or near the waters of Montgomery Creek, Horn Spring, Stony Creek, and other smaller streams. All camps within this division will be numbered from 1401 to 1499 inclusive.

Lightning Report.

Trees struck and shattered during the year were as follows:

	June.	July.	August.	Total.
Chestnut,	1	2	.....	3
Oak,	1	.....	1	2
Pine, .....	.....	1	.....	1
Total, .....	.....	.....	.....	6

Trees struck and ignited:

	May.	June.	Total.
Chestnut stub,	1	.....	1
Pine stub,	1	1	2
Total, .....	.....	.....	3

These stubs were ignited during a very heavy shower, and burned at least fifteen minutes before they were extinguished by the rain.

A notable piece of work by Forester Dague was the result of his disposal of the undesirable timber upon a 250-acre tract in his division. As a result of his work he was able to pay all his expense and produce a net yield of \$4.63 per acre from land which originally cost the State \$2.50 per acre for 7,592 acres. The further result of his operation is that he has a forest in an improved condition, which will rapidly grow into great value.

From an area of 100 acres in compartment 3, a cutting of over-mature, dead, and dying timber was made during the year 1911 and sold during 1912. The total output amounted to 183,000 board feet and the net income amounted to \$6.00 per thousand feet.

9. THE CLEARFIELD FOREST, KARTHAUS DIVISION.

Forester, Nelson R. McNaughton, Karthaus.

Forest Rangers:

William Buck,¹ Odessa.

William E. Schultz,² Karthaus.

M. A. Barr,³ Karthaus.

The forester was assigned to this division in September, 1911. Previous to that date it had neither forester nor ranger. Ranger Schultz was appointed July 1, 1912, but resigned in September because he was unable to support himself and family on the salary which the Department could afford to pay.

The topography and geology of this region have been reported upon in the 1911 report of the Department.

No official survey of the boundary of this division has been made, although tentative surveys have been made by the forester and his rangers. These have been brushed out roughly 3 feet wide, blazed, and painted, and all will be posted. All corners were repaired but no old marks were removed. The total distance in miles thus far brushed out and marked amounts to 27 miles.

No sub-division into compartments can be made until the boundary survey is completed. The winter of 1912-13 was open with little snow fall. In 1913 the last frost occurred on June 10th, the first, September 10th. On July 12th a small tornado passed over part of the State land on the south side of Gifford Run. It covered a small area but mowed down everything in its path. The heavy late frosts caused the growth to be below normal.

The posting of the lands is proceeding as rapidly as it can under the circumstances. Where boundary lines cross roads, trails, fire lanes, or streams, signs are being placed indicating the line and the direction of the State land.

There are a number of interior tracts, all of which would be desirable for State purposes. It may not be possible to acquire them for some years to come.

From the deeds of conveyance and the rough surveys thus far made, it is estimated that the total area of this division is approximately 32,000 acres.

¹Began service July 1, 1912.

²Began service July 1, 1912; resigned September 15, 1912.

³Began service June 1, 1913.

There are few large trees on this land and no mature or over-mature trees. Only about 6,000 acres are covered with a density of stand of 50 per cent. or over. This growth is still too young to need improvement. The area covered with a stand having a density of from 10 per cent. to 50 per cent. amounts likewise to about 6,000 acres.

The brush lands divide into two parts, those which may be reforested naturally and those which must be reforested artificially. The former represents about 5,000 acres and the latter about 11,000 acres.

Approximately 2,000 acres may be said to be open ground. 500 acres are densely covered with rocks and about 500 acres comprised in the area of springs and streams. At least 1,000 acres are occupied by roads and trails, and 50 acres by fire lanes. The brush area, the poor stand, and the rocky areas which need not be reforested at this time, reach a total of 17,500 acres. Later on, of course, attention must be given to them, but at the present time all efforts are to be put upon the remaining better land.

Springs and Streams.

Springs and streams are not yet definitely located on the finished forester's map. Of the springs thus far improved, 7 are permanent, while the others fluctuate with weather conditions.

The stream flow is irregular. Snows melt suddenly and rains rapidly disappear. Two of the streams are subject to heavy freshets, Mosquito Creek and Deer Creek.

No pollution of streams occurs at the headwaters in the State Forest. Mosquito creek is polluted by the dumping of refuse at its mouth, while mine drainage enters the West Branch.

Buildings and Repairs.

There are no buildings on the division except those occupied by Monn, the squatter, and a board shack on Chestnut Ridge. There are no telephone lines at present, although they are needed. The nearness of the Huntingdon and Clearfield Telephone Company would make a system of lines within State land of great value.

Roads.

In 1912, 4 of the roads in this region were repaired, aggregating a distance of about 16 miles. Brush and stones were removed, holes filled, grades and bridges repaired. In addition to the road work done, about 4 miles of fire lanes have been brushed, raked and burned for the first time, and about 30 miles of trails brushed.

During the year 1913, 23.5 miles of roads, fire lanes, and boundary lines were repaired. This work consisted of brushing, removing stones, surfacing, bridging, plowing of ditches, removing old logs, and other obstructions.

Minerals.

Bituminous coal occurs in the western part of the division. The vein has been opened on the north side of Red Ridge. It is believed to be $4\frac{1}{2}$ feet thick and of good quality.

Plantations.

One small experimental plantation of one acre was made in 1912, using 1 pound of white pine seed in spot planting 6 x 6 feet. The seeds were destroyed by rodents and the plantation, therefore, was a failure.

The Lost Run plantation was made during 1913 in a scattered growth of scrub oak, chestnut, and a heavy growth of bracken and sweet fern. Plantings were made 4 x 4 and the following species and quantities were used:

European larch,	2 years, ..	5,000
Norway spruce,	2 years, ..	5,000
Silver pine,	2 years, ..	1,000
Norway spruce,	1-2 years, ..	8,000
White pine,	1-2 years, ..	17,000
White pine,	2-1 years, ..	310,100
Total,		346,100

Two acres of the area were treated by seed spot planting which was a failure. The seeds used were two pounds of white pine and one pound of Scotch pine.

Labor.

The current rate of wages in this region in 1912 was \$2.00 per day of 10 hours. The forester was able to procure labor at 17c. per hour for a ten-hour day without board, although but 9 hours a day are actually employed in labor, as an hour is necessary to go to and from the laborers' homes. The rate is too low for the region and the best labor cannot be procured. A working team with a driver costs \$4.00 per day of 10 hours.

The coal mines in the neighborhood draw the best labor and influence the rate of wages. Miners earn from \$3.00 to \$5.00 per day.

It is not much of a farming community and agricultural labor is scarcely to be had. If the wages of the State could be made equal to those paid in the mines, a desirable class of laborers might be procured. It is found better in this region to use small crews of men for longer time than larger crews for a shorter time.

Markets.

Markets have not yet been carefully studied because of the fact that there is not sufficient material on hand to justify the investigation.

Growth.

A portion of the forester's time during the year was occupied in collecting data on the growth and volume of white pine cut in the Huntley and Bailey operation near the Hoover farm. A tabulation of this data has been made and will be printed as a separate bulletin of the Department. A number of supplementary forms for field use have been prepared by the forester.

Erosion.

No serious erosion is occurring in this forest at present. The steep hillsides have been cut to bare rock for many years. The plateau-like upper surface is not subject to erosion in the same degree. Reforesting is needed everywhere, however, to prevent further washing.

Insects and Fungi.

No insect attacks are noticeable. The chestnut bark disease appeared sparingly in 1912 near the State Forest. The trees so discovered are to be destroyed. In 1913 the infection invaded State land.

Forest Fires.

There were no fires on the State land during 1912. 800 acres of adjoining private land were burned. The forest officers contributed their efforts toward the extinguishment of these fires. The season was unfavorable for fire because of frequent rains.

Two fires burned on State land during 1913, covering an area of 2,050 acres. 4,745 acres of adjoining private land were burned. One of the fires is believed to have originated from the burning of brush by Harry Coulter. This defendant was arrested but the indictment was ignored by the Grand Jury. The circumstances of the ignoring of

the bill are of peculiar interest. If the citizens of the county are not sufficiently interested in protecting their own woodlands from incendiarism, it makes it exceedingly difficult, and sometimes, as in this case, impossible, for the Department to bring punishment to those believed to be guilty of crimes of this character. The destruction on State land by these fires may be said to be complete. There was little or no standing growth, so that the loss is at a minimum, but even then this will reach a total of at least \$5,000.

Three observatory stations have thus far been built, one on the eastern division on Twelve Mile Run, and two on the western division. The fire wardens of the region are competent and do their duty well. Special mention is to be made of C. C. Billotte, of Coudley, and Moses Liegey, of Odessa. If fire wardens throughout the State were as vigorous in attending to their duty and accomplishing good results as these two gentlemen, there would be a different story to tell.

Trespass.

One case of trespass is reported for the year, arising from lack of surveys and poorly marked lines. Mr. Q. E. Beauseigneur cut a quantity of wood on State land unintentionally, on the basis of wrong information given him with respect to the location of a line. In settlement of the value of timber thus destroyed, Mr. Beauseigneur paid \$57.17.

The intended prosecution of Harry Coulter for negligence in allowing fire to escape while burning brush, is commented upon above. The respectable and law-abiding people of the neighborhood in which this fire occurred did all in their power to assist the Department to bring the prosecution to a successful termination. Although this failed, these neighbors are entitled to the highest commendation for what they have done, especially since it was done at some danger to themselves and their own interests.

During the open deer season two does and one fawn were illegally shot on or near the State land, and the animals were forwarded to the Clearfield hospital. No information is at hand as to who did the shooting.

The forester reports that a large amount of intoxicating liquor was brought into the State Forest by hunters during the season, to the detriment of the morals among the men.

Outing and Recreation.

During 1912, 39 different permits embracing 215 campers were issued. There were at least 100 persons camping without permits because of not being familiar with the rule. Having camped there

the previous year when there were no forest officers on the land, they were not aware that permits were needed. All were warned to procure permits for the next season.

So far as known, 38 deer were killed on or near the reserve, 4 does, 1 fawn, and 4 bears.

During the year 1913, permits were issued for 52 camp sites to a total of 305 persons. All were orderly and law-abiding except the group that was camped at Lincoln spring in Covington township. This camp, composed of eight men, was disorderly from the start. The men were in an intoxicated condition, which prevailed throughout their stay. Fights were started, guns and knives drawn, and murder narrowly averted. Happily they left the State land before they could be removed by the forester. These men were a menace to their own safety and to the safety of every other hunter in their region. It is the policy of the Department to discourage the taking of intoxicants into camp and their use on State land.

So far as statistics can be had, the following large game was taken or illegally killed on or near the division in Covington, Girard, and Goshen townships: Male deer, legal size, 52; fawns, 4; female deer, 3; bears, 6.

All camp sites are or will be numbered consecutively from 1601 to 1699 inclusive, and posted in a conspicuous manner.

Lightning Report.

Trees struck and shattered during 1912, were as follows:

	June.	July.	August.	Total.
Pitch pine,	1	1	2	4
Red oak,	1	1	2	4
White pine,	1	1	1	3
Chestnut,		1	2	3
Gum,			1	1
White oak,		1		1
Total,				16

No trees were ignited. The heaviest electrical storms occurred between July 25th and August 15th. The stroke followed in every instance, the grain of the wood. In the white pine trees it ran straight from tip to ground. In the twisted or cross-grained trees it ran spirally. The experience in this forest is that trees which are most abundant in a stand seem to be struck oftenest, regardless of species. One notable instance of the effect of the lightning stroke was where,

after leaving the tree, the bolt dug a ditch 18 inches wide, 20 inches deep, and 30 feet long.

During the year 1913, 20 trees were struck and shattered. The periods of frequency were as follows:

June,	1
July,	13
August,	6
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Total,	20

The species struck were:

White pine,	6
Pitch pine,	6
Chestnut,	6
Red oak,	2
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Total,	20

10. THE CLEARFIELD FOREST, PENFIELD DIVISION.

Forester, Carl L. Kirk, Penfield.

Forest Rangers:

Frank Johnston, Penfield.

C. O. Timblin,¹ Penfield.

The Penfield Division of the Clearfield State Forest lies in the northwestern corner of the county and extends over a few acres lying in Elk county. Two divisions of the forest are recognized, a northern and a southern.

Boundary survey is completed and was made by Wm. M. Grove, of Centre county. The 46 miles of lines are marked, witnessed, and painted. Corners are built up and prominently marked. Since finishing the survey the lines have been brushed, repainted, and reposted.

The area of the division is now 9,631 acres, 68 perches. 4,000 acres have a density of 50 per cent. or over, 2,000 acres need improvement by removing dead and dying trees. This would yield probably 100,000 feet of chestnut and maple. A large part of the area needs nothing but protection at this time. 4,000 acres are covered with a density

¹ Began May 1, 1912; resigned August 31, 1913.

of from 10 per cent. to 50 per cent. and include both conifers and hardwoods. Occasional small patches need strengthening by planting. 2,000 acres are covered with brush and require clearing for planting. The division is not rocky and will grow timber anywhere. The water area is not large, probably not exceeding 10 acres. Roads and trails occupy about 50 acres. These include the fire lanes. Boundary lines cut out to the present width occupy approximately 20 acres. The planting of the barren land will require some preparation, not exceeding an average cost of \$3.00 per acre. Occasional careful burning will accomplish all clearing necessary.

Springs and Streams.

All good springs have been located and cleaned. Those near roads, lanes, and trails have branch roads cut to them and are marked with boards carrying the name of the spring. All the waters become low in dry weather, and a number of the springs fail. The main streams flow continuously and there is no contamination.

Building and Repairs.

The building of a telephone line was undertaken in 1912 to connect each of the rangers' homes with the forester's headquarters at Penfield. A local line associated with the Bell lines was found to be $1\frac{1}{2}$ miles from Ranger Timblin's house, but in order to reach Ranger Johnston's house, south of Penfield, it was necessary to build a new line about 5 miles in length. Poles 18 feet long set 200 feet apart and procured from the forest, were used. Occasionally poles of 22 and 23 feet in length were employed. Braces were supplied to all poles having a side pull. A number of the farmers nearby who desired to connect with the line, contributed labor and the use of their teams, while the rangers used their own horses for skidding and hauling poles. The hanging of the wire and the installation of the telephones were done by the forester and his rangers. The farmers who helped in the preliminary work for the privilege of connecting to the line are H. A. Bonnett, Walter Reiter, Lewis Wirts, J. Bundridge, Wm. King, John Reamer, and A. C. Long. Two of the telephones were in working order by November, but before the instrument could be used in Ranger Johnston's house, it was necessary to procure a crossing of the Pennsylvania Railroad at Penfield. This was finally accomplished by using the poles of the Penfield Coal Company. The line from Ranger Johnston's house to the house recently built at Bloody Spring, was completed during September, a distance of $2\frac{1}{2}$ miles. The building of 7 miles of telephone line cost in actual money

\$40.25 for hired labor. The rest of the work was contributed by farmers and forest officers. By inducing as many of the local residents as possible to attach to the line, it is found that much greater protection may be given to the State land in the case of forest fires. The expense to individuals is but \$5.00 a year, plus the cost of purchasing their own telephone instruments. Already a number of branch lines are projected to reach outlying settlements, and these will carry additional lines through the State Forest, affording additional protection. Two township school houses are located within the State Forest.

Roads.

During 1912, 7½ miles of old roads were brushed out for the first time, while 21½ miles of old roads were rebrushed and improved. To date within this forest there are 40 miles of good open road, 3,600 feet of trails or fire lanes, and 3 miles of boundary lines cut out and marked.

During 1913, 25 miles of road were worked upon and improved. Road improvement cost at the rate of 46c. per hundred feet.

Minerals.

The minerals under this division of the forest are not owned by the State. Title was acquired to the surface only. A three feet vein of coal is being mined by the Penfield Coal and Coke Company.

Plantations.

Preparatory to planting trees in 1912 on the northern sub-division, about 30 acres of land were cleared along the upper side of what is known as the Toby road. Planting was also undertaken on the opposite side of the road, but little clearing was needed. On the southern division 20 acres were cleared near the home of the ranger. The following seedling trees were planted:

Scotch pine,	2 years, ..	57,000
White pine,	2 and 3 years, ..	116,000
Total,		173,000

At the time of planting, the ground was in a moist condition and all seedlings made satisfactory growth.

Whenever time permits, clearings of land are made for the following spring planting. When the weather is too wet or too windy to

permit the burning of brush, it is piled for burning in the spring. On the northern sub-division 15 acres were cleared in this way and a somewhat smaller area on the southern.

In 1913, such clearing as was necessary preparatory to planting was made in January. Clearing cost \$4.00 per acre and planting \$2.20 per thousand. The plantings were made 5 x 5 feet and covered 112 acres. Plantings during 1913 were as follows:

White pine,	2-1	years, ..	39,500
White pine,	3	years, ..	22,000
White pine,	2	years, ..	27,000
Silver pine,	3	years, ..	2,500
Red pine,	2	years, ..	10,000
Norway spruce,	3	years, ..	10,800
Norway spruce,	2	years, ..	16,000
Total,			127,800

Total plantings to date on this division are as follows:

Rock oak,	1,775
Red oak,	2,000
White ash,	4,000
Red ash,	14,000
Black cherry,	5,700
American elm,	5,000
Norway spruce,	140,000
Scotch pine,	208,500
Silver pine,	2,500
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Total,	383,475

Nurseries.

Two small nurseries were established during 1912, one on the farm occupied by Ranger Johnston, and the other on the property occupied by Ranger Timblin. The following seeds were planted in the Timblin nursery:

White pine,	4	pounds
Norway spruce,	5½	pounds
Red pine,	1	pound
Scotch pine,	2	pounds
Douglas fir,	1	pound
Total,		13½ pounds

In the southern division in Ranger Johnston's nursery, the following seeds were planted:

White pine,	4 pounds
Norway spruce,	6½ pounds
Red pine,	1 pound

Total, 11½ pounds

Total for the two nurseries, 25 pounds.

The money outlay for establishing the two nurseries amounted to \$23.31. The necessary work was done by the forester and his ranger. The cultivation was carried on by the rangers.

An inventory at the close of the growing season shows the following stock on hand:

Northern Nursery.

White pine,	8,000
Red pine,	16,000
Scotch pine,	8,000
Norway spruce,	10,000
Douglas fir,	12,000

Total, 54,000

Southern Nursery.

White pine,	9,500
Red pine,	21,000
Norway spruce,	44,000

Total, 74,500

Total for the two nurseries, 128,500.

The necessary nursery screens are being made out of material collected on the State land. Both will probably be enlarged. Stumps where necessary were removed by dynamite.

An inventory of nursery stock at the end of the 1913 season shows the following seedlings:

Johnson's: One year old.

White pine,	18,590
Norway spruce,	78,400
European larch,	34,600

Total, 131,590

Two years old.

Red pine,	10,800
Norway spruce,	37,300
White pine,	7,800
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Total,	55,900

At the Timblin place the inventory shows the following, all of which are available for next spring's planting:

Timblin's:

Two years old.

Douglas fir,	12,000
White pine,	6,500
Red pine,	15,000
Norway spruce,	9,000
Scotch pine,	8,000
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Total,	50,500

The available product from the two nurseries for 1914 planting is 106,400 trees of all species.

Sample Plots.

Experimental plantations have been made, using red ash, white ash, black cherry, American elm, and white pine. The pine and cherry are a complete success and the elm is doing well. The ash are apparently frozen out.

Labor.

Labor costs \$1.75 per day. The nearness of the mines makes labor scarce. Team with driver costs \$4.00 per day.

Markets.

The nearby mines require a limited number of props and caps. These are bought from farmers who have woodlots. Some of the mine companies own their own woodlots. Mine caps are worth \$3.50 per thousand and mine props \$28.00 per thousand. Props for the Penfield mine are required to be 3 feet long and 4 inches in diameter at the small end. Any kind of wood is taken. At the Tyler mine they must be 4 feet long. Pit ties are worth 10c each. The roads which serve as an outlet to the markets are good and the rates are reasonable.

Erosion.

Because of the small water courses and the lack of steep grades, there is little erosion. The soil has almost a complete covering of some kind of growth, small trees, sod, or bracken. Occasionally there are thickets or brambles, all of which serve to maintain erosion at a minimum.

Insects and Fungi.

At two different times during 1912, the employes of the Chestnut Blight Commission searched this division thoroughly for the chestnut bark disease and found two infections. These were destroyed and the disease has not reappeared. A nearby stand of locust has been completely ruined by the locust borer.

Forest Fires.

The forestry force assisted in extinguishing three fires during 1912. Owing to the moist season there were no fires in the fall. The first fire occurred in April on private land north of Penfield. About 25 acres of brush were burned, doing little damage other than destroying the brush. The second fire occurred in May on private property west of Penfield, and started, it is believed, from a railroad locomotive. The section crew assisted in extinguishing the fire, which covered about 200 acres of rocky brush land. The last and most serious fire occurred on State land and on adjoining private land in the slashing left by the Central Pennsylvania Lumber Company. It ran from June 10th to 14th, and the line of back fires extended for 8 miles. 850 acres of State land were burned over and probably more than 5,000 acres of private land.

In 1913, 15 different forest fires occurred on State land and on neighboring private land. Two burned on State land and 9 on private land only, while 4 burned on both State and private land. The area of State land burned is 135 acres and of private land 6,856 acres. In many instances the destruction was complete but the woody growth was of little value, so the loss was small. The topography of the region is such that forest fires are easily discovered. The difficulty chiefly found is the getting of men quickly enough to extinguish them. The fires on State land originated from the outside.

Outing and Recreation.

Small game hunters are numerous. Few persons camp upon the State land. Game is abundant. All streams contain trout. All camp sites within this forest will be numbered consecutively from 1501 to 1599 inclusive.

Lightning Report.

During 1913, 71 lightning strokes are reported. In 8 instances the trees struck were ignited. The months of frequency are as follows:

March,	1
April,	9
May,	11
June,	13
July,	8
August,	14
September,	12
October,	3
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Total,	71

The species struck were as follows:

Chestnut,	34
Oak,	8
Maple,	5
Basswood,	5
Ash,	4
Cucumber,	3
Birch,	4
Beech,	2
Pine,	3
Hemlock,	3

11. THE GRAYS RUN FOREST.

Forester, Arthur B. Wells, Fields Station.

Forest Ranger, L. T. Newman,¹ Fields Station.

The Grays Run Forest lies in the townships of Lewis, McIntyre, and Cogan House, Lycoming county. Its geological, topographical, and climatic conditions are as follows:

Geology.

There are four geological rock formations in the Grays Run forest, all belonging to the carboniferous age of the paleozoic era. They are the Pottsville conglomerate, the Mauch Chunk red shale, the Pocono sandstones, and the Catskill red shale and sandstones.

The Pottsville conglomerate is a coarse white quartzose sand-rock in some places filled with pebbles of quartz. It occurs in isolated blocks on the top of Fording and Narrow mountains and in mass on top of Schriver mountain north of Bartoff hollow, growing in thickness toward the north.

The Mauch Chunk rocks underlie the Pottsville conglomerate.

The Pocono rocks are largely made up of coarse, gray, flaggy sandstones. They are nearly all current bedded, frequently micaceous, and often greenish or greenish-gray. These rocks overlie the Catskill and make up the great mass of the mountains in this region. They extend down to the springs at the foot of the steep heads of the main hollows.

The Catskill rocks are composed principally of red shale and sandstone, but with some beds of gray shale and sandstone. This formation composes the floor of the valleys and extends up to the steep heads of the main hollows.

The soil on the reserve is mainly a sandy red clay covered with a shallow humus. The humus is deepest on the gentle slopes and on the north slopes. In many places overlying loose rocks make it difficult for plant growth to get started.

Topography.

The topography is mountainous. There are four large mountains in the reserve, three running north from Lycoming creek and one running west from Grays Run village.

¹Resigned September 30, 1913.

Schrivier mountain occupies the east edge of the reserve. At its base on the west flows Grays Run.

Fording mountain lies west of Grays Run and extends north to Dry Run and the saddle at Newman's.

Kinney ridge, a minor mountain, runs west from Grays Run north of Dry Run to Round Top. At its base on the north flows Long Run.

Long Run mountain extends west from Grays Run north of Long Run to the northwest corner of the reserve. Elk Knob ridge is a spur extending south from Long Run mountain between warrants Nos. 5656 and 5657.

Four Mile run rises between Elk Knob and Round Top and flows southwest between Elk Knob ridge and Narrow Mountain to Laurel Hill run.

Six Mile run rises northwest of Elk Knob and flows west to the west boundary of the reserve where it turns south flowing finally into Laurel Hill run.

Skunk Hollow run lies in the basin between the part of Elk Knob ridge south of Elk Knob and the spur running west, then south from Elk Knob.

Narrow mountain lies west of Fording mountain and between the two flows Hagerman Run.

The reserve is mainly side hill with about 500 acres bottomland and 1,000 acres comparatively flat mountain top.

Climate.

The following table compiled by the official weather observer at Williamsport, will give a good idea of the climate of the Grays Run Forest, which is 18 miles north of Williamsport.

1912.	Maximum.	Temperature.		Rainfall and snow-fall.
		Minimum.	Mean.	
January,	45	-17	31	1.21
February,	55	-7	31	3.07
March,	65	10	37.5	3.95
April,	80	19	49.5	4.13
May,	87	35	61	2.58
June,	83	41	67	0.79
July,	93	48	70.5	3.22
August,	86	47	66.5	9.65
September,	89	36	62.5	5.23
October,	82	30	56	2.45
November,	69	19	44	2.93
December,	66	10	38	2.49

There were three heavy frosts in this region in June.

The boundary survey of this forest was completed last year and the lines have been brushed, painted, and posted. Much of the boundary lines has been brushed out so as to serve as fire lanes.

There are no private lands entirely surrounded by this forest. A number of adjacent tracts would fill out the area properly and ought to be purchased.

The area of this forest is 6,915 acres and it contains no virgin growth.

At least 1,000 acres carry a stand of hypermature trees composed of crooked and unsound beech, birch, and maple left by the lumbermen, while in other localities small groups of cull trees are to be found. It is estimated that this material would produce 1,000 cords of pulp wood and 200,000 feet of rather indifferent lumber. Natural regeneration is progressing and where protected will soon cover the ground with a satisfactory stand.

A dense and vigorous young coppice growth covers about 4,000 acres and which will need thinning later, but is too young at this time. It runs about 18 years in age and is composed of oak and chestnut 25 feet high. Basswood, birch, beech, and maple in the ravines and slopes also prevail.

A growth having a density of from 10% to 50% is found upon 500 acres of the remaining area. Normal density is being restored by natural growth. Here and there artificial strengthening would be of assistance.

A brushy growth of scrub oak, bracken, briars, and huckleberry bushes is found on another 500 acres. Here natural regeneration is slow and normal density may have to be secured by artificial planting.

An area of about 800 acres is steep and rocky and artificial regeneration is impracticable at this time.

A number of old fields and mill sites and severely burned areas may aggregate 40 acres. Here seedling trees may be planted with little difficulty.

The water within the forest covers an area of about 13 acres, the roads and trails 49 acres, the fire lanes 13 acres.

The condition of this forest is such that 5,500 acres, if properly protected, will sufficiently stock itself by natural regeneration, 500 acres where planting ought not to be undertaken at the present time, 40 acres now in condition to plant, and 875 acres of rocks, water, roads, trails, and fire lanes where planting may not be made.

Springs and Streams.

There are many springs within this forest, most of which are cleaned and accessible. They have not yet been named according

to any system. A number of the springs disappear during drought. They are located in gravel beds where the water passes off underground except in wet seasons. Some of the streams likewise disappear in the same manner.

The flow of springs and streams varies with the precipitation. Much of the humus has been destroyed by fire and sufficient time has not elapsed for its restoration. Where steep slopes are adjacent to streams, the run-off is rapid.

There is at present no danger of contamination from any source.

Buildings and Repairs.

There are no buildings located within this forest.

A telephone line passes through the area, following the tracks of the Susquehanna and New York railroad. It is probable that this line may be purchased in the near future.

Roads.

The road work during 1912 consisted of cutting out the boundary lines, mowing the brush, removing old trees, repairing and building bridges, widening, ditching, and supplying culverts where needed. The total length of roads, trails, fire lanes, and boundary lines thus worked over will aggregate about 36 miles, about 20 miles of which are roads, 5 miles trails, and 11 miles fire lanes and boundary lines. Thirty miles of the same roads, trails, and fire lanes were improved during 1913.

Easements.

The Susquehanna and New York Railroad Company had a right of way through the forest, but has abandoned it and removed the rails and ties.

Seed Collection.

During the month of October, 1912, 470 cubic inches of the seed of basswood were collected at a cost of \$3.23. The whole quantity has been planted in a temporary nursery. Seeds of the yellow birch were collected during the same month amounting to 150 cubic inches. The whole quantity was likewise planted in a temporary nursery. A quantity of seed was collected during 1913 for the seed exhibit of the Department at Harrisburg, about 50 species of trees, shrubs, and smaller plants being represented in the collection.

Plantations.

The area of State land planted during 1912 was 13½ acres. The planting by species during the year was as follows:

Norway spruce,	12,000
Red oak,	18,900
Welsh willow cuttings,	6,000
Almond willow cuttings,	6,000
	<hr/>
	42,900

Planting during the year 1913 was as follows:

White pine, .....3 years, ..	10,000
White pine, .....1-1 years, ..	8,000
Norway spruce, .....1-1 years, ..	11,500
Willow cuttings,	700
	<hr/>
	30,200

The seedlings and cuttings planted in this forest to date are as follows:

White pine,	18,000
Norway spruce,	23,500
White ash,	2,000
Sugar maple,	400
Honey locust,	400
Red oak,	22,400
Welsh willow cuttings,	6,700
Almond willow cuttings,	6,000
	<hr/>
	79,400

Black walnut, 4 bushels.

The planting of spruce at the head of Hagerman Run is thrifty. In other places the young trees were injured by drought and frost. From these causes severe injury has been noticed respecting the trees on the dynamited plot and the check area. Their condition can be told better at a later date.

The total area in this forest planted to date with seeds and seedlings trees is 28.4 acres.

Labor.

The labor in this region is of good character. It is sometimes abundant and at other times scarce. The men naturally seek the

highest wages. Contractors in the woods pay up to \$2.00 per day. The rate for the Department has been \$1.75 per day of 10 hours. The farmers in the region pay but \$1.50 per day. Team with driver costs \$4.00 per day.

Improvement Cuttings.

Some improvement work was begun in 1912 in the cutting out of dead chestnut and other cull trees. About 100 trees which had been injured and were decaying at the base, were made into railroad ties. Eleven and a half cords of beech, birch, and maple for pulp wood and a cord of fire wood were disposed of. All the trees were either dead or defective. The need of improvement cutting is shown by the condition of the forest described above.

Improvement work was continued in 1913 by George Newman, who removed 70 cords of dead chestnut. A small area was cleared of dead and dying willows in preparation for planting. Culling and taking out of over-mature and defective hardwoods is under way at present by Messrs. Vickery, Fleming, and Clendenning. These trees being rapidly on the decline, are removed for the purpose of benefiting the lower story of the forest.

Market.

Fire wood, ties, pulp wood, and extract wood sell rapidly in this market. Fire wood is worth \$7.00 per cord of 160 cubic feet delivered at Trout Run. Fire wood of dead and defective trees is sold to local consumers who gather and remove it themselves, at 10 cents per quarter cord of 128 cubic feet.

The nearby railroads will purchase ties at the following prices:

No. 1 White oak and rock oak,	70c.
Chestnut and rek oak,	55c.
No. 2 White oak and rock oak,	50c.
Chestnut and red oak,	35c.

A market for chestnut wood, dead or green, is found in the extract plant at Newberry, where a price of \$4.00 per cord of 128 cubic feet delivered is paid. The local stumpage price is 50 cents per cord. The specifications call for sound wood 5 feet long and not over 12 inches in diameter.

Cull trees may be sold at 50 cents per cord of 160 cubic feet stumpage, or mill cut price of \$3.75 per thousand feet is offered. Transportation is good and rates reasonable.

Erosion.

This forest is subject to a minimum of erosion except in some of the Grays Run lowland, where the stream changes its course from time to time. The forest cover is generally sufficient to prevent any serious wash, although the dirt roads are subject to it.

Insects and Fungi.

A number of hemlocks have been killed by the bark beetles, and the attack still seems to be in progress. Porcupines have killed a number of trees and injured a number of others. The most serious invasion has been made by the chestnut blight and the willow leaf beetles. The chestnut bark disease has invaded this area to a considerable extent and continues to spread. The scouts of the Chestnut Blight Commission first assisted in locating the diseased trees and the work was conducted by the forester and his rangers. The most useful method of locating trees was found to be the taking of observations from the tops of commanding trees with the use of pocket telescopes. All trees attacked were cut and burned and the work of eradication is being continued.

A spotted willow leaf beetle defoliated many of the native willows and killed a number of them. The plantations are comparatively free of them at the present time. Hand picking and paris green poisoning are used to protect the basket willows. The heavy frost on June 14th, 1912, seemed to check their ravages.

Forest Fires.

There were no forest fires on this State land during 1912, and but one during 1913, covering a half acre. A number of natural observatory stations are found within the forest. The residence of the ranger is so located that it commands an open and extended view

Trespass.

Cattle from the neighborhood will stray on to the State land, but the owners are warned and usually remove them in a little time. They have done little damage. Wherever suitable grass is found the staking out of milch cows for local residents is permitted.

Outing and Recreation.

During the 1912 hunting season 2 camps were located in this forest and occupied by 9 men. These gentlemen were careful about their conduct and were scrupulous to observe the law and the rules.

During the season 5 deer were killed on the State land, and so far as could be learned, 300 grouse, 150 rabbits, 100 squirrels, and 1 raccoon were taken.

Two camps were erected within this forest during 1913. Four deer are known to have been taken and the usual amount of small game killed.

Fishing is scarcely more than fair. The mountain brook trout is the only game fish found in State waters. The streams are suitable for trout, which would thrive well if planted and protected. Hedging in of the streams with brush and crown growth is necessary to darken the pools. Fishing has been restricted because of the attitude of the Grays Run Hunting and Fishing Club. All camp sites in this region will be numbered from 1701 to 1799 inclusive.

Lightning Report.

So far as could be learned, during the months of June, July, and August the number of trees struck and shattered by lightning is as follows:

White pine,	2
Pitch pine,	1
Rock oak,	3
Chestnut,	8
	<hr/>
	14

No trees were observed to be ignited after being struck.

12. THE HOPKINS FOREST, RENOVO AND KEATING DIVISIONS.

Forester, Forrest H. Dutlinger, Westport.

Forest Rangers:

George W. Armstrong, Westport.

William C. Huff, Westport.

John Liggett,* Beech Creek.

Howard P. Seese, Renovo.

A. L. Shoemaker, Beech Creek.

John Winkebleck, Beech Creek.

The Hopkins State Forest is located in Clinton county, and embraces the State lands lying south of the West Branch of the Susquehanna River. It contains the Renovo, Keating, and Snow Shoe Divisions.

The present forester was assigned here April 1, 1912, on the transfer of former Forester H. A. Thomson to the Black Forest in Lycoming county.

The character and size of this forest have been reported upon in previous reports of the Department. The assignment of Messrs. Funk and Sheeler to the Keating and Snow Shoe divisions, gave them the remainder of the Hopkins State Forest. Since the resignation of Mr. Funk, the Keating Division has been managed with Renovo.

The forest was enlarged during the year by the conveyance of the Robert Irwin tract from the New York Central and Hudson River R. R. Co., as reported upon more fully elsewhere.

Springs and Streams.

All have been definitely located and will be indicated on the map. Many of the streams are accessible by means of wagon roads. Not all springs are continuous in flow. The majority are affected by the amount of rainfall. Several disappear during drought. Lack of humus seems to be responsible for the fluctuating conditions. The streams average a length of about 6 miles, are somewhat irregular in flow, and free from contamination.

*Resigned May 31, 1912.

Buildings and Repairs.

The ranger's house at State Camp needs attention. A new house is a necessity at that place. Repairs are needed at the Armstrong farm. Huff's camp at the head of Burns Run is in good condition.

Roads.

During the portion of the year 1912 the present forester was in charge, 14½ miles of old roads were rebrushed and 7 miles of the Beech Creek road running from Beech Creek to Renovo were rebuilt. One and a half miles of new fire lanes were opened. In 1913, the entire system of roads, trails, and fire lines was mowed during the year. One mile of new fire line was opened and mowed.

The following is the road mileage open to date:

Roads,	20 miles.
Fire lanes,	50 miles.
Trails,	7 miles.
	<hr/>
	77

Easements.

The Borough of South Renovo, by reason of lease, procures water from Halls Run for borough purposes. Same is reported upon elsewhere. A right of way has been granted to the N. Y. C. & H. R. R. through the Hopkins Forest on the south bank of the river. Better transportation facilities will be offered, but fire danger increased. A timber lease which is being exercised at the head of Boggs Run has thus far covered an area of about 200 acres. Improvement of the forest is very noticeable. Because of the condition of the trees they produce an inferior grade of lumber.

Plantations.

Seedlings as follows were planted within this forest during 1912:

White pine, .....3 years,	50,000
Scotch pine, .....2 years,	20,000
Pinus ponderosa, .....2 years,	2,000
	<hr/>
Total,	72,000

Pinus ponderosa was planted at the Armstrong farm, Scotch pine in the Swamp Branch of Big Run, and white pine in the same locality, continuing a former plantation. The total acreage covered by this planting is 28.

In 1913, two plantings were made, one using 62,000 3-year old white pine, and the other 11,500 3-year old Norway spruce. The June frost injured the growth of the young trees, freezing the terminal buds and retarding their height growth considerably.

Plantations to date cover 108 acres, using the following species:

Black walnut,	2,353
White ash,	8,500
Honey locust,	2,000
White pine,	162,000
Scotch pine,	25,000
<i>Pinus ponderosa</i> ,	2,000
Norway spruce,	11,500
Silver pine,	5,000
	<hr/>
	218,353

A 3-acre walnut plantation made in 1904 is located adjacent to State Camp, the headquarters of Ranger Seese.

Sample Plots.

Two sample experimental plots have been made, one with 2,000 2-year old *Pinus ponderosa*, the other using 5,000 3-year old Silver pine. They will be the subject of further investigation and report.

Improvement Cutting.

A large quantity of over-mature and defective trees was standing in Boggs Run. This material was deteriorating and needed to be used at once should there be any intention of saving it. A contract was accordingly entered into with C. D. Raker of North Bend to remove the oak, the oak bark, and the jack pine prop timber. The result of this operation was that from February to December, 1912, material was taken out as follows:

Prop timber, 2,484.99 tons at \$1.00 per ton,	\$2,484.99
Bark 142.865 tons at \$2.00 per ton,	285.73
	<hr/>
Total,	\$2,770.72

The removal of this material leaves this forest area in a better condition and natural regeneration will proceed rapidly provided forest fires are kept out. The stumps sprouted during 1913 and many good shoots were sent up.

Labor.

Labor may be had at varying prices, depending upon the location of the work. It ranges from $17\frac{1}{2}$ cents to $18\frac{1}{2}$ cents per hour. Teams cost from 40 cents to 50 cents an hour, with or without driver.

Markets.

There are no wood-using industries and little local demand for timber. The car shops at Renovo take a small amount. Prices range somewhat below the average. The coming of the N. Y. C. R. R. will better the market conditions. Forest products may then be loaded directly from the forest on to the cars.

Insects and Fungi.

The chestnut bark disease was discovered in 1912 at the head of Pete's Run by an agent of the Chestnut Blight Commission, in three infected trees. The trees were cut and destroyed, but the significance of its presence there is that it has invaded this division and a constant lookout must be maintained in the future in order that it may not obtain a foothold, from which it will be difficult to dislodge it.

Forest Fires.

A single forest fire is reported for this division during 1912. Two hundred and fifty acres of State land were burned over. The fire was first noticed November 6th, and was extinguished by a rain the same night. The damage was slight, only a portion of the humus being burned. The cause of the fire is unknown. No fires occurred during 1913. A number of fires on private land were extinguished by the forest force.

Outing and Recreation.

During the year 1912, 20 permits were issued to as many camping parties for location within this division. No violations of the laws or rules came to the notice of the forester. So far as could be learned from report received, 10 deer were killed on State land during the season.

In 1913, 30 camping permits were issued into this forest. About 250 persons availed themselves of the privilege. So far as known, about 20 deer and 10 bears were taken. Small game seems to be abundant. Wild cats are increasing. Trout streams are numerous but poorly stocked.

All camping sites within the divisions have been numbered and posted, those on the Renovo division beginning with 1901 and those on the Keating division with 2001.

Lightning Report.

Trees struck and shattered during 1912 are as follows:

	July.	August.	Total.
Chestnut,	1	1	2
Jack pine,	3	4	7
Black oak,	1		1
			<hr/> 10

No trees are known to have been ignited by lightning bolts. There are no data for 1913.

13. THE HOPKINS STATE FOREST, SNOW SHOE DIVISION.

Forester, George W. Sheeler, Snow Shoe.

Forest Rangers:

John Winkebleck*§, Beech Creek.

A. L. Shoemaker*, Beech Creek.

The Snow Shoe Division of this forest is located in the northern part of Centre county and the southwestern part of Clinton county. This division resembles very greatly an interior holding. It is the southern extremity of a solid block of nearly 100,000 acres of State lands. It is bounded on the north and west by the Renovo and Keating divisions of Hopkins forest, and the Midland Mining Company lands. On the east by the Pennsylvania Paper Mill Company, Midland Mining Company, and Cato Coal Company lands. On the south by the Midland Mining Company, Cato Coal Company, and Lehigh Valley Coal Company lands. The Snow Shoe Division constitutes only about 8% of a large unsettled scope of country.

Topography.

The topography of this reserve is simple in its features. It is located on the southeastern slope of the Pine Glen-Hyner axis of the Allegheny plateau. Bordering on the crest of this axis, one finds a broad, plain-like plateau gently sloping to the southeast. Considering it as such, the forest forms the headwaters for numerous mountain streams. These streams flow in accordance with the slope, eventu-

*Transferred from Renovo Division.

§Appointed June 1, 1912.

ally reaching Beech Creek, and on their way they are continually cutting rather deep and narrow valleys. These valleys become more distinct and the uplands more rugged as one goes through the forest in a northeasterly direction, starting from Snow Shoe Summit.

Beech Creek rises in Snow Shoe Summit through the medium of its two forks, the North fork and the South fork. As it flows in an easterly direction it cuts the Allegheny plateau into a narrow valley with steep and rugged sides. It becomes the recipient of all the streams originating on this division of State lands.

The northwestern slope of this axis while not included in this division has similar topographical features. The streams flow into the West Branch of the Susquehanna River. On this dome-shaped axis between the two slopes a road known as the Ridge Road, from Snow Shoe to Renovo, is found. This road marks the northern and western limits of the Snow Shoe division.

Geology and Soil.

As already mentioned, this forest lies on the southeastern slope of the Pine Glen-Hyner anticlinal axis. The rocks of this ridge dip away normally to the southeast. However through the rising and the sinking of the axis along its line of trend, from northeast to southwest, it produces differences of dip and sequences of measures so as to bury alternately beneath the surface and elevate the various strata. This is true with the Mauch Chunk red shale and the Lower Productive coal measures. Following the crest of the axis and on the flats dividing the headwaters of the streams, conglomerates predominate. Considerable distance from the crest in a southeasterly direction and on the southwestern portion of the reserve, coal measures, red shale, and Pocono sandstones occur, but only the former appear in any marked degree on the hills. In the northeastern portion, conglomerates, shales, and sandstones prevail, while the coal measures are rarely seen. The shales and sandstones occur on the slopes and in stream beds. (See Map.)

The soils produced by these few members of the palaeozoic formation are residual in character and fall into the Dekalb series. Generally speaking, they are the lighter soils of this series and derived from the Pocono sandstones, Pottsville conglomerates, Mauch Chunk red shale, and the Lower Productive coal measures.

The types of soil found in this forest are Dekalb silt loam, Dekalb stony sand, and rough stony land.

The Dekalb Silt Loam.

The surface soil of the Dekalb silt loam, to an average depth of 6 inches, is a light, friable silt loam, gray to light brown in color on the immediate surface, changing to pale yellowish beneath and

passing into the subsoil without any distinct line of demarcation. The subsoil consists of a pale yellowish silt loam occasionally becoming heavier with the depth and generally somewhat close and compact. It contains a large proportion of finer grades of sand which tend to make it friable. This sand content often gives a gritty feel to it when in sufficient quantities in the surface soil. Fragments of sandy shale sandstones are found on the surface and in the soil mass varying from a few scattered pieces to a relatively high percentage.

The DeKalb silt loam occurs in a number of areas, somewhat scattered. These areas are developed on the top of the plateau,—stream divides largely, yet not confined entirely to this position,—and on the benches of slopes. The drainage as a rule is excellent.

The Dekalb silt loam is residual in origin, being derived through weathering from the shales and fine-grained sandstones of the Carboniferous age. The texture of the shale rock varies from clayey to gritty or sandy. The sandstone beds are thin and the rock fine-grained.

In geologic time this formation, Lower Productive coal measures, was covered by another formation known as the Unproductive or Barren measures. Removal of these upper beds in part has exposed the productive measures and given rise to the type of soil here described. Areas of this type are known locally as red shale areas.

The Dekalb Stony Sand.

The fine-earth material of the Dekalb stony sand consists for the larger part of the medium-textured sand or loamy sand, though there is a range in texture from rather coarse to fine. The immediate surface is dark colored, owing to a shallow covering of organic material. Beneath this the color becomes light gray to pale yellow, the latter usually continuing through the subsoil, though in places the subsoil is a reddish yellow. The average depth of the soil is about 5 inches. There are practically no lines of demarcation between the soil and the subsoil. There is usually enough clay and silt in the soil to make it slightly sticky, and in places the proportion is sufficient to produce a heavy loam. On the other hand the soil in places is merely a partially disintegrated conglomerate rock, and it then has the texture of a coarse sand. These departures from the typical soil occur only in small areas. In both soil and subsoil are found more or less weathered and disintegrating sandstone and sandstone conglomerate. Here and there small outcropping ledges of these rocks also appear. The quantity of rock fragments increases with depth and there is very little fine sandy material below 2 feet from the surface. The stones and boulders and the outcrops

are always sufficient to interfere with the forestal management, but not seriously.

The Dekalb stony sand is the most extensive soil in the forest. It occupies the broad tops and the gentle slopes of the ridges or stream divides. In some places it extends down the slopes to the stream banks, but here it is often displaced by rough stony land. The Dekalb stony sand has been derived through weathering from the Pottsville and Pocono formations, the former largely a sandstone conglomerate and the latter a coarse-grained sandstone. These formations are of Carboniferous age. As with most soils derived from sandstone the structure is open and porous and the natural drainage free, much of the rainfall passing into the soil.

Rough Stony Land.

The rough stony land occurs on the steep slopes of the streams. The agencies of erosion have been so active in these areas as to remove all of the surface soil with the exception of few small amounts held by tree growth. The Pocono sandstones usually give rise to this form of land. They are sand rocks of hard texture with a cement not easily soluble with water and humic acid. Interspersed with these sand rocks one will also find conglomerates of the Pottsville formation. These formations are of Carboniferous age.

THE RANGES.

The Snow Shoe Division, Hopkins Forest, is divided into three distinct areas called ranges. These ranges assume their names from the locations of their rangers' headquarters. The following are the ranges:

- Wolfe Run Range (headquarters at Snow Shoe).
- West Branch Range.
- Little Bear Range.

The Wolfe Run Range.

The territory covered by this range includes the southwest portion of the forest. It lies in Burnside and Snow Shoe townships and contains about 7,900 acres.

The topography is regular in outline. The northeast portion borders on the Pine Glen-Hyner Anticlinal. The streams originate near this axis and flow to the southeast. They divide the range into

a rolling plateau with narrow but not deep channels. This is due to the gentle slope of the country. These streams, Big Sandy, Beauty, a tributary of Sandy, and Wolfe Run have a large portion of their course included here. Panther Run merely has its origin on this range owing to the State line taking a northwesterly direction and approaching the ridge.

The larger percentage of the soil is sandy and known as the Dekalb stony sand. At the headwaters of the forks of Beauty, an area of approximately 300 acres of red shale soil appears. This falls in the Dekalb series and can be spoken of as the Dekalb silt loam. Numerous small areas of this soil prevail throughout the range but not worthy of mention. Along the slopes of the streams rough stony land predominates.

The tree growth is rather limited. Mostly on the shallow soils of the stony sand type, scattered growths of fire-scarred chestnut coppice, rock oak, and a few jack pine (*Pinus rigida*) which the lumberman left, remain. The deep soils of the silt loam type support a more abundant tree growth and of better trees financially. These consist mostly of the oaks,—white, red, black—and of chestnut. Few tracts of merchantable timber remain. This may be considered a two-storied forest. The jack pine predominates and is the high forest. Chestnut coppice, rock oak, and a few jack pine form the low forest and are of a composite type. They are located on scattered areas starting from Big Sandy across the headwaters of Beauty and Wolfe runs. They border on the red shale areas. Between the right fork of Beauty and Wolfe Run, there exists the largest and best tract found on this division—a solid block of jack pine.

The larger part of this range is out of the coal measures. However, in the southeastern corner on the west tract there are strong indications of coal. This coal is part of the lower productive coal measures of the Cato coal basin. It is called high coal locally. Indications of fire clay prevail above the fork of the left and middle branch of Beauty, and above the coal measures near the west tract. A few places have been found also between Wolfe and Panther Runs, but as to extent very little is known.

The West Branch Range.

This range is located in the central part of the Division. It contains about 7,260 acres and is situate in Curtin, Burnside, and Beech Creek townships.

The general topography is hilly. Bordering on the Pine Glen-Hyner axis, the plateau is dissected by two streams, Eddy Lick and West Branch of Big Run with their tributaries, which have their

origin in this range. These streams have narrow and deep channels. The hills between are broad and even, gently sloping to the southeast.

The soil for the most part is of conglomerate origin. It falls into the Dekalb series and is a type of the Dekalb stony sand, many areas resembling the Dekalb sand. These soils are found on the hills and the plateau. Interspersed with them are small scattered areas of silt loams. On the slopes of the streams many rocks of sandstone origin are exposed. These together with the conglomerates give way to the type Rough Stony land.

The tree growth on this range is scant. Very little merchantable timber can be found anywhere. However, near the headwaters of Eddy Lick there is some jack pine which extends on the southern side of the Ridge road. This can be included on this range. It is the only timber worthy of mention. On the flats, scattered growths of chestnut and chestnut oak coppice are found. On the larger part of the range, the growth is fire scarred and from present indications will not produce a desirable quality of timber.

Minerals are scarce. Clay appears near the Cottage camp site. Extent and quality are yet to be determined.

Little Bear Range.

Little Bear range is located in the northeastern part of the Division. It contains about 7,820 acres and is situated in Beech Creek and Curtin townships.

The topography of this range is hilly. It borders on the Pine Glen-Hyner axis and contains broad gently sloping stream basins bordered by rocky divides of conglomerates and sandstones. The streams that originate in these basins are Big and Little Bear, tributaries of West Branch of Big Run; Swamp Branch, a tributary of the Middle Branch; and Middle Branch itself, all flowing to the southeast and emptying into Big Run.

The soil of these basins is sandy and deep. It contains types of the Dekalb stony sand and Dekalb sand. The Dekalb sand is similar to the former but does not contain so many rocks. It is deep and often silty. The soils are hard to distinguish due to their slight variations in texture and structure. The divides in most places are narrow and of a stony batter of sandstone and conglomerates. Where the divides are broad, the soil is sandy and shallow. A few small areas of silt loam occur and when found they contain a large percentage of sand which changes their character and texture to a very marked degree.

The tree growth is poor. Scattered in these basins are deformed and defective trees. A growth of chestnut coppice, rock oak, jack

pine, and a few white pine are found. Very little merchantable timber stands. This is scattered and in difficult places. It was left by the lumberman owing to the hard conditions. In Thorn Apple hollow, a local name, jack pine, white oak, and white pine stand. In Hendrix hollow a few yellow pines and white oak remain. Along the line of the Pennsylvania Lumber Company, which borders this range, scattered trees of jack pine still remain.

Minerals are scarce. Indications of clay and coal in Graham hollow and near the State Line are fair. The quality and extent of these have never been investigated.

SUMMARY.

The Snow Shoe Division lies in the Allegheny plateau. It maintains an elevation anywhere from 1,900 to 2,000 feet above sea level. It slopes gently to the southeast. The streams all empty into Beech Creek. On account of its elevation the climatic conditions change considerably. The growing season is short and frosts occur late in the spring and early in the fall. A heavy frost as late as June 9-10, 1913, killed and injured a large part of the young vegetation. On September 17th, 1913, the region was again visited by frost. The winters are cold with considerable snow, while the summers are cool.

The soils are of the Dekalb type and as a class are poor for farming. A few areas, however, could be used for farm purposes, but their position would not allow profitable farming on account of the poor roads and great distance from marketing centers. At present the lands are best adapted for forestry.

This forest has been lumbered over three times. The white pine was taken first, then the hemlock and chestnut, and lastly, in the convenient places, the lumberman came for jack pine. Few areas of scattered jack pine remain. The trees on these areas are declining. They would make mine props and sawed timber.

A severe fire swept the forest about 5 years ago leaving it in an unsightly condition. It is recovering, by sprout growth principally. Areas of red and of white oak, white pine, and jack pine may be found. Large areas could be established artificially. Fire protection is the greatest problem for consideration.

Labor conditions present another problem. Settlements are not convenient to the forest, the nearest being five miles to the eastern line. Furthermore, plenty of work can be had right at home.

The revenue producing power of this forest could be developed. There is some timber that might be lumbered profitably now. Coal and clay lands, if investigated, would yield some returns. These are the most profitable lines at present indicated for development.

The boundary survey is not yet completed. A portion was surveyed recently, which part has been painted and posted. The remainder of the line has been posted where it was possible to determine its position.

The former area has been reduced by re-arranging the divisions. The area of this division is now approximately 23,000 acres, 8,287 acres in Centre county and 14,713 in Clinton county. It contains no virgin forest. Neither is there any mature or hypermature forest. At least 15,000 acres are in need of immediate improvement. Ninety-five per cent. is coppice regeneration less than ten years of age. The balance is in the polewood stage. The area having a density of from 10% to 50% may reach 5,000 acres; that over 50%, 15,000 acres. Brush and weeds cover 2,000 acres or more. Fifty per cent. of the whole forest may be reforested naturally with proper protection. Five hundred acres are covered with rocks, 26 with water, 96 with roads and trails, and 4 with fire lanes. All this land has been severely burned. Protection from fire is its chief need.

Springs and Streams.

All the waters are tributaries of Beech Creek. The principal springs are kept clean and accessible throughout the year. All are named and posted. The deep-seated springs flow continuously. A few fail during extreme drought. The restoration of the forest cover will help many of them. The streams are variable for the same reason that the springs are. Springs and streams are not subject to contamination.

Buildings and Repairs.

There are two sets of buildings in this forest, those at the West Branch camp and those at Little Bear camp, and are in good condition. A camp is needed at the head of Wolfe Run. Additional permanent camps are needed for the use of the forest force. To conduct work properly on this division it is necessary to camp. Camping can much more satisfactorily be done in small buildings than in tents. All distances in this region are very great.

Telephone lines are within 5 miles of State land and within 10 miles of the nearest camp.

Roads.

Ten miles of old roads have been brushed out for the first time and 34 miles have been rebrushed and improved during 1912. Fire lanes were opened for a distance of 10 miles. The building of a new road

was begun and completed for three-fourths of a mile. During 1913, 49.5 miles were worked over. All road work is planned for future use in lumbering. The total number of usable roads, trails, and fire lanes in this division at present is 53 miles.

Minerals.

Coal and fire clay are found in certain parts of the forest. The extent and quality are unknown because unexplored. The distance from market at present would prevent operation.

Plantations.

Two forest plantings were made during the year, one known as the Beauty plantation on the Wolfe Run Range, and the other on the Mosquito Hollow plantation on the West Branch range. The seedlings used were the following:

Scotch pine,	1 year,	5,000
White pine,	2 years, ...	5,000
		<hr/>
		10,000

The area planted, 2.15 acres, contained a scattered growth of chestnut coppice and scrub oak with thick bracken.

Nurseries.

Fourteen pounds of seed were used in establishing two small nurseries at the rangers' headquarters. The purpose is to try out the cost of production.

Labor.

Labor is scarce, wages are high, and the quality of the labor is not up to the average. Rates are governed by the wages paid in the coal mines, brick works, and other industries. The mines pay \$2.64 for an 8-hour day. A coal miner at piece labor earns from \$3.00 to \$5.00 a day in 8 hours. A brick maker \$4.00 to \$5.00 in a day of 10 hours. Ordinary labor is paid \$1.75 per day of 8 hours. To get work done in the forest it is necessary to offer \$2.00 for a 10 hour day or \$1.50 with board. Teams cost \$4.00 per day. On the West Branch range 60 cents per hour is paid.

The cost of living in Snow Shoe is abnormally high, and while working in the mountains men are unable to be at their homes every

night. Most of them would rather work in the settlement than in the woods. Good men are in constant demand.

Markets.

The market in this region absorbs mine timbers freely. Almost any kind of wood is taken. Jack pine is preferred. The demand is about 240,000 props per year. These are from $3\frac{1}{2}$ to 5 feet long, 4 inches in diameter at the top, and sell for 4 cents a piece at the mine. In addition to props, cap pieces and mine straps are called for. The quantity of the former used per year is estimated at 76,000, worth 1 cent each, and of the latter approximately 30,000, worth 10 cents each.

A haul of at least 10 miles is necessary to place material produced within the State Forest at the mines or railroad stations. It is probable that mine props might be shipped with profit to the hard coal region, using either the New York Central or the Pennsylvania railroads. The railroad rate on mine timber to the hard coal region from Snow Shoe is from \$1.75 to \$2.00 per ton.

At present 300 acres of the State land could be cut over for the production of mine timber. Wherever this timber is over-mature or declining, such cutting ought to be done.

Insects and Fungi.

Insects and fungous diseases are attacking and killing the jack pine timber. Possibly other causes are at work.

Forest Fires.

Great interest in fire protection is being taken throughout all this region. The forester is the secretary of the Central Forest Fire Protective Association and is in active co-operation with the Northwest Fire Protective Association. The local fire warden, James F. Uzzell, is the very best man for the place. He is energetic, capable, and understands his business. He also understands how very necessary it is to suppress forest fires. Two outlook towers have been equipped during the year. They are simply trees with ladder and platform. But one fire burned on State land during 1913, and covered an area of 210 acres. It is believed to have been set maliciously. Eight other fires occurred on private land and in all private holdings to the extent of nearly 3,000 acres were burned. Nine hundred cut mine props were thus consumed and in all but two instances the burns were extremely severe.

Outing and Recreation.

Seventeen camp sites within the forest accomodated 120 campers in 1912. Obedience to the laws and the rules of the Department was willingly rendered and the conduct of the men is not subject to criticism.

During the hunting season 16 deer were killed either within the State Forest or nearby. Bears, pheasants, wild cats, and foxes abound, and a number were taken.

In 1913, 22 permits for hunting camps were issued into this division. Many hundreds of people hunted on State lands for a day only but did not camp. About 30 deer were taken, 12 bears, and a great many pheasants, rabbits, and small game. Fishing is good. All camps on this division will be numbered from 2101 to 2199 inclusive. Twenty-four regular camping sites have thus far been established and posted.

Lightning Report.

Ten different lightning strokes were counted during 1913, 6 in July and 4 in August. The species struck and shattered were

White pine living,	1
White pine dead,	1
Chestnut,	1
Jack pine,	5
Rock oak,	2
	<hr/>
	10

14. THE KETTLE CREEK STATE FOREST, CROSSFORK DIVISION.

Forester, R. Lynn Emerick, Crossfork.

Forest Rangers:

J. H. Green, Crossfork.

Milton L. Keeney, Crossfork.

Henry M. Olson,¹ Crossfork.

Harry VanCleve, Crossfork.

Harry L. Jarrett,² Crossfork.

The Crossfork Division of the Kettle Creek State Forest is located in Stewardson and Abbott townships, Potter county. The survey is complete except that of about 200 acres near Crossfork. The boundary lines are blazed and painted white, the corners well marked, and the State blaze placed wherever convenient to put it. Notices are also placed at frequent intervals along the boundary line and throughout the area.

This forest is divided into five ranges, which comprise two general blocks or working areas. The Crossfork area is protected by Rangers Green and VanCleve; the Kettle Creek area by Rangers Jarrett, Keeney, and Olson. On September 1st, 1913, Thomas H. Golden was assigned to this division to assist Mr. Emerick as forester. He is one of the 1913 graduates of Mont Alto. From April 1st, 1913, to October 1st, Forester Funk was present, assisting the Chief Forester. He resigned on the latter date. The rangers in this forest are particularly efficient men, and the teamster, Mr. Mattison, who is also a regular employe, is a careful man of regular habits, and takes great interest in his work.

The boundary survey has been completed with the exception of the small tract around the town of Crossfork. There are a number of important interior tracts in the region aggregating something over 400 acres. The present area of the division is 59,593 acres. The forest contains no virgin, mature, or hypermature stands. About 10,000 acres have a density of 50% or over. This tract is young. Birch reproduces best naturally. All growth is too young for improvement cutting. That portion having a density of from 10% to 50% is 24,112 acres. Most of the trees are fire scarred and deformed, and are making little growth. A portion of this area could at this time be subjected to improvement cutting. It would yield

¹Began April 1, 1912.

²Began April 1, 1913.









from 100,000 to 120,000 cords of pulp wood. The hindrance to marketing this product is transportation facilities. Of the remainder, 25,000 acres are brush land. Fifty per cent. of this division will reforest itself if protected from fire and grazing, but the method is slow. No other feasible method presents itself except planting. Two hundred acres are open ground. Twenty-five acres are covered with rock. Eighty-five acres with streams; two acres by a pond; 200 acres with roads and trails; 75 acres with fire lanes. Profitable reforestation could be conducted at this time by planting operations.

Springs and Streams.

Twenty-five springs have been cleaned and repaired. All have been named and more than half posted with proper signs. All have been located upon the map of the division. The springs and streams show some diminution of flow in dry weather. There is no contamination.

Buildings and Repairs.

Various dwelling houses belonging to the Department are in a fair state of repair, and generally in good condition, except the ranger's headquarters at Abbott. Here a new house is needed. Such fences as are needed are in good repair.

A 2-wire line of telephone extends from Crossfork to New Bergen, a distance of 14 miles, and another 2-wire line from Crossfork to Crossfork Junction, a distance of 13 miles, is owned by the Western Union Company, and which allows the Department the use of its wires and line throughout its length. The Crossfork-New Bergen line was built by the Department. The system may readily be extended to Hulls and the Pump Station.

The Stone house was remodeled and is now in a good state of repair. The office building at Crossfork is in good condition. Two other Crossfork buildings need repair, and a new barn is required. The division now has 28 miles of 2-wire telephone system in good condition. The inhabitants are permitted to attach free of charge, making their own connections and installing their own instruments. The system requires extension so as to reach the adjoining foresters. A water service is required at the Stone house. A good spring 300 feet distant with sufficient fall will supply all needs.

Crossfork, the forester's headquarters, is extremely isolated. All manufacturing and lumbering operations have ceased and by far the larger part of the population has departed. The situation in which the forest staff finds itself is peculiar and different from every other State Forest managed by the Department. Here is an instance where the State, by extending its forest operations, may furnish needed help to a stranded community.

Considerable effort has been made to beautify and improve the old town of Crossfork, which is the forest headquarters. Two hundred hard maples have been planted along the streets and others are to be planted. Rubbish has been cleaned away, foundations removed and filled. Thirty-seven building lots were thus cleaned, graded, and leveled. The engine house, mill, store room, foundry shop were torn down and the lumber piled. The mill pond was drained and the inlet repaired, the dam breast reinforced and flood gate repaired. Old logs afloat on the pond were removed and were found as sound as when first cut. The cribbing along Kettle Creek has been reinforced to prevent washing. The water system was cleaned and reinforced, involving the repair of a fire hydrant and shutting off of old connections. This water line now owned by the State is 11,447 feet in length, with an 8-inch intake pipe reduced to a 6-inch main. Water is in constant flow with good pressure. Twenty sections of 3-inch cotton fire hose with nozzles and hose cart comprise the fire department.

A small public library has been started in a separate building with books and magazines, which are loaned free to the people. To this library Dr. Rothrock contributed 43 volumes. A recreation room for children and one for grown people is to be established. The forester has given a number of addresses among the clubs and public schools of the county. Forester Golden addressed the Crossfork schools on Arbor Day.

Roads.

During 1912, 11 miles of old roads were brushed out for the first time and 16 miles re-brushed and improved. Five miles of new fire lanes were opened and an additional mile of boundary line brushed out. A new road has been brushed out and partly completed for a distance of 3 miles.

The total number of open miles of roads within this forest at present is 30, trails 1½, fire lanes 20, and boundary lines opened 1 mile. All fire lanes will ultimately become roads. Twenty-seven miles of telephone lines have been built or repaired during the year.

To show the part which the Forestry Department plays in maintaining the Stewardson township roads, the following statement may be of interest:

Cash road tax,	\$177 95
License fees,	60 00
Received from the State Highway Department,	181 90
Received from the Forestry Department as fixed charge on State lands,	814 98

Plantations.

During 1912, the following planting of seedlings was made:

White pine,	178,700
Scotch pine,	20,000
Red oak,	40,000
Norway spruce,	22,000
P. ponderosa,	2,000
<hr/>	
Total,	262,700

The area devoted to the above planting is 150 acres. Seed planting has been employed in a few instances, and 1,540 square feet of such planting has been made to date.

Planting during 1913 was as follows:

Norway spruce, .....2 years,	82,500
White pine, .....3 years,	237,800
Pinus monticola, .....3 years,	2,000

The total area planted to date on this division is 347 acres, and the total seedlings thus far planted are 693,100, as follows:

White pine,	491,500
Norway spruce,	107,500
Scotch pine,	25,000
Silver pine,	2,000
Pinus ponderosa,	2,000
Red oak,	40,000
White ash,	20,000
American elm,	3,000
Honey locust,	1,500
European larch,	600
<hr/>	
	693,100

All plantations are doing well with the exception of the white ash and larch. The larch froze out and the ash was frozen back. Fall planting does not produce satisfactory results in this region.

Nurseries.

A small nursery was established in the spring of 1910 with an initial area of 420 square feet. The nursery was enlarged during

1912 by adding 1,120 square feet, making its area at present 1,540 square feet. A stock inventory at the close of the 1912 growing season shows the following:

2-year olds.

White pine,	24,000	
Norway spruce,	15,000	
Scotch pine,	10,000	49,000
		<hr/>

1-year olds.

Douglas fir,	40,000	
Dwarf mountain pine,	50	
Blue spruce,	15	
Chinese arbor vitae,	10	
Persimmon,	20	
Russian mulberry,	6	
Catalpa speciosa,	25	
Black locust,	60	40,186
		<hr/>
		89,186

The number of seedlings available from this nursery for planting in 1913 was the 24,000 white pines, which have cost \$2.75 per thousand.

Ten pounds of seed were used in the small local nursery, 5 of Norway spruce and 5 of white pine. The *Pinus ponderosa* planted on this division shows a slow growth. The average for 1913 was one inch. However, they have a thrifty appearance. The other seedlings appear to be doing well. Could fall planting be used successfully it would solve the labor problem and give us a longer growing season. In 1913 the growing season extended over about three months. The white pine plantations are doing particularly well, showing a growth of over 90 per cent. and an annual maximum growth as great as 26 inches the second year. Two small ranger nurseries have been established in addition to the one at Elk Lick farm. Each contains 200 square feet, one for Ranger Olson, and the other for Ranger Van Cleve. The former succeeded well but the latter was destroyed by rodents. Seedlings in the Olson nursery to date are as follows:

White pine,	3	years, ..	2,340
Norway spruce,	2	years, ..	5,300
Douglas fir,	2	years, ..	640

The small local nursery at Crossfork begun by Forester Funk in 1913 contains 480 square feet. Frost killed the Norway spruce and the sparrows destroyed the white pine. The supposed useful effect of red lead to prevent birds interfering with the young trees, which was used here in great abundance, was proved to be fallacious. Nursery attempts are to be renewed the coming season with prospect of better results. An experimental plantation was started but no data are yet available. A few seeds of the following species were received and are being tried out:

Citrus trifoliata,	Hemlock,
Pinus taeda,	Blue spruce,
Black locust,	Pinus ponderosa,
Catalpa speciosa,	Chinese arbor vitae,
Russian olive,	American white spruce,
Russian mulberry,	Pinus flexilis,
Scotch pine,	Jack pine,
American arbor vitae,	Austrian pine,
Persimmon,	Taxus cuspidata,
Dwarf mountain pine,	Abies concolor.

An experiment was also made in planting white pine, both with and without the puddling of the seedlings. At present no difference in results is shown. Honey locust is shown to be a slow grower in this region. The Elk Lick planting of 1,500 shows but two inches. Possibly the freezing of the terminal bud is responsible.

Labor.

The matter of labor on this division is a most serious matter. If men are to be retained within the region they must have regular employment. There is no other industry present than the activities of the Department of Forestry, and during the winter season the demand for labor decreases largely. \$1.60 is the average price paid per day. The cost of a team is \$4.00 per day.

Markets.

Market conditions at present are extremely poor. There is no local industry to consume any forest product. A large quantity of scattered material now on the ground should be removed for the betterment of the woods, but unless it can be removed at a profit, it becomes at once a losing operation.

Insects and Fungi.

The pine weevil has been noticed for the first time in the Elk Lick plantation. In an area containing 25,000 plants 217 infections were discovered. All infected trees were removed and burned.

Forest Fires.

There were no forest fires on this division during the year 1912; and no fires were started within the State Forest during 1913, but a number from without burned in. In this way the following areas were burned over:

Abbott Range,	1,500 acres
Leidy Range, now in charge of Forester Müller,	100 acres
Oleona Range,	5 acres
Crossfork Range,	750 acres
North Bend Range, Young Woman's Creek Forest, now in charge of Forester Mumma,	1,500 acres

Three observatory stations have been established and fires are being located by means of the triangulation method. Our telephone system helps greatly in this matter. Fires can be located with approximate precision. The local fire wardens are efficient and respond promptly.

Outing and Recreation.

No use was made of State Forest land except for hunting and fishing. 14 camps were erected during 1912 and the conduct of the campers was above criticism. During the open hunting season 7 deer and 3 bears were killed. Pheasants were plentiful.

Twenty-five camping parties visited the locality in 1913. Three camps with 18 persons were present in the early spring. 22 camps with 25 persons were present during the fall hunting season. All have become warm friends of forestry work. Hunting for large game was poor. 7 deer were taken and 3 bears, and between 5,000 and 6,000 pheasants.

Trout and black bass fishing are excellent. Probably 100 or more fisherman visit Crossfork every year. 20 cans of trout were planted in Lyman Run, Crossfork, and Little Kettle Creeks.

Camp sites in this division are numbered from 2,201 to 2,299 inclusive, and 12 have been definitely fitted up for camping purposes. 5 permanent camp leases have been granted within the division to date.

Lightning Report.

Twenty-one lightning strokes are reported during the year, all occurring in the month of September. 14 were in dead chestnut and 7 in hemlock. In addition, one bolt ignited some soft maples and burned into the surrounding brush land.

15. THE HOPKINS STATE FOREST, KEATING DIVISION.

Forester, Nathaniel B. Funk,¹ Westport.

Forest Ranger, William C. Huff,² Westport.

1912.

The Keating Division of the Hopkins State Forest is located in Centre and Clinton counties, and has not yet been sub-divided. The survey of the boundary is complete. Painting and posting have been done.

Springs and Streams.

All accessible springs have been cleaned and the rules for the government of the forests prominently posted. All streams had a regular flow during the year. At present there seems to be no possibility of contamination.

Buildings and Repairs.

The cabin at the head of Burns Run is in good repair, but the house at the mouth is worthless. If it be decided that a building is needed here, it must be built anew. There are no telephones within the division and none nearer than Westport.

Sign boards painted black and lettered in white, are placed at the intersection of roads and trails showing distances and directions.

Roads.

The forester was assigned to this division September 1, 1912, and since he has been in charge, 30 miles of old roads have been rebrushed and improved. This includes the whole number of open improved

¹Resigned October 1, 1913.

²Transferred from the Kenova Division.

roads within the division. A trail 3 miles long extends along the river from Yosts Run to Jews Run. Practically the whole time of the forester was given to road improvement.

Labor.

Labor in this region costs 17½c. an hour, and a team \$5.00 per day. The population is sparse and labor scarce. The quality, however, is good.

Markets.

There are no local markets for forest products. When improvement work begins it must be done by the invitation of outside capital.

Forest Fires.

A fire occurred on State land on November 9th, burning over an area of 250 acres at the head of Burns Run. The damage was about a 50 per cent. destruction of the humus on the forest floor. The origin of the fire is unknown.

Outing and Recreation.

During the season the forester was in charge, 14 different camps were erected on State land, and the conduct of the campers was proper in all respects. 7 deer and 6 bears were killed.

There are at least 16 good camping sites, and others could be readily adapted for camping from time to time.

16. THE LOYALSOCK FOREST.

Forester, John A. Bastian, Loyalsock.

Forest Rangers:

George H. Pidcoe, Barbours.

George M. Lipp, Montoursville, No. 1.

The Loyalsock Forest is divided by the Loyalsock Creek into two natural ranges, the eastern and the western. Ranger Pidcoe has charge of the western range, and Ranger Lipp of the eastern. The boundary survey is complete with the exception of 1,000 acres which have recently been added. The line is well blazed and posted. A portion of the boundary line was brushed during the spring of 1913. All surveyed lines need painting. The total area of this forest is 14,063 acres, 125 acres virgin forest, 250 acres mature forest capable of producing 750,000 feet of lumber. The species are hemlock, pitch pine, white pine, chestnut, and oak. Regeneration on the rock area may best be accomplished from seed trees. About 7,000 acres have a density of 50 per cent., of which 2,000 need improvement. This land carries today approximately 4,000 chestnut posts, 1,000 tons of mine props, 1,500 railroad ties, 4,000 cords of wood. Because of the distance from market it is not possible to sell anything except at stumpage rates. About 6,000 acres have a density of from 10 per cent. to 50 per cent. 500 acres are brush land, 500 acres are rocky land, 25 acres water, roads and trails occupy 59 acres, fire lanes, 20 acres.

Springs and Streams.

The springs which are usable in case of fire have been cleaned and trails cut to them. The springs have not yet been named. A few of the springs are not continuous in their flow during extreme drought. Because of the wet season during 1912, all springs were continuous, with a large flow.

The streams are affected by droughts and usually become low during the summer months. At present there seems to be no contamination.

Buildings and Repairs.

There are no buildings on the area belonging to the State, except a camp at the headwaters of Little Bear Creek. Other buildings are needed, especially a home for the forester.

The forester and each of the rangers has a telephone at his home or boarding place. The Loyalsock Telephone Company has built a line up Loyalsock Creek as far as Bear Creek, which ought to be extended. The rental is \$12.00 per year, and the service includes Williamsport and Muncy.

Roads.

During 1912, the length of old roads rebrushed and repaired amounted to 13 miles. 6 miles of fire lanes were opened and 1 mile of new road partly completed. Road work in 1913 was confined to laying out and brushing new roads and repairing an old one.

The total number of open roads traversable at present is 21 miles, with 7 miles of fire lanes.

Easements.

C. W. Rishell has been granted the use of an old log road for his timber operation.

Minerals.

Coal exists on this forest, but the vein is too small to operate profitably at present.

Plantations.

During the spring of 1912, 8 pounds of white pine were employed in spot planting upon small unstocked areas. The germinating percentage of the seed was low and the results were not satisfactory. The area covered amounts to 6 acres.

The total plantings to date amount to 8 acres. In 1912 the following plantings were made:

White pine,	7,800
Elm,	3,000
Black cherry,	1,300
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	12,100

The number of seedlings planted to date within this forest is 22,100.

Nurseries.

A small nursery bed measuring 4 x 40 feet was started with Douglas fir. After the various troubles of the 1912 season, 1,500 seedlings came through and remained in the nursery. In 1913 these were re-

duced to 1,200. A small bed of Scotch pine was planted in the garden but the seedlings were destroyed by the damping-off fungus. Another bed of Scotch pine was started in a sandy place, but the seeds were destroyed by mice and squirrels.

Labor.

Labor in this region costs $17\frac{1}{2}$ c. per hour, or $12\frac{1}{2}$ c. with board furnished, while team with driver cost 35c. per hour in 1912, but now 40c. The nearby lumbering operations draw the best men and keep up the price of labor. What labor may be had is of fair quality. Much of it is furnished by small holders in the neighborhood who have little clearings of their own and may devote occasional days to outside work.

Markets.

Market conditions are not of the best. Fire wood and fence posts lead in the sales. Lumber from dead trees is worth about \$1.50 per thousand stumpage. The low price is due to the inferior character of the lumber. Fire wood is worth 25 cents per load green and 15 cents per load dead. Transportation facilities are poor. The nearest point is 7 miles. There are no large towns near and the roads are rough. With increase in lumber prices the material in this forest will come into the market. Improvement of the public roads will improve market conditions. The wood within the neighborhood is being rapidly marketed by private owners who are satisfied to make small profits, and when it is gone, the State land will be able to supply a portion of the demand.

In 1913, 9,000 feet of hemlock were sold at a stumpage price of \$6.00.

Erosion.

Owing to the fact that the forest cover is nearly intact, little erosion is going on at present. The root systems of whatever living material is present hold the soil well, and especially on steep slopes.

Growth.

The growth over this region is fair. Some of it is fire scarred, many of the trees are scattered, some are hypermature. The undergrowth is thrifty but with protection will soon be in condition for thinning.

Insects and Fungi.

No insect attacks of any moment have been noticed. The chestnut bark disease was discovered in the eastern range in the spring of 1912. All trees attacked by the blight have been cut and destroyed.

Forest Fires.

On November 21st, 1912, a small fire covering 1½ acres occurred on State land in Gamble township. The unsettled top leafage only was destroyed and a few sprouts less than an inch in diameter. The origin of the fire is not known.

In 1913, 3 of the 5 local fires were on State land, covering an area of 325 acres. Three fire observatory stations have been erected and sites for five more located.

Outing and Recreation.

During the hunting season of 1912, three camps were occupied by 28 persons. Their conduct was all that could be desired.

With the increase of timber growth, hunting is becoming better year by year. The absence of fires in the woods makes permanent homes for many birds and small game. Eleven deer were reported killed either on State land or nearby. Pheasants are increasing in number but few were killed. A number of bears were reported taken.

In 1913, 3 camping parties were present during the open season, numbering 25 persons in all. Fourteen deer were reported taken on or near State land. Pheasants were not abundant. There bears and a number of squirrels and rabbits also are reported.

The camp sites on this division will be numbered from 2401 to 2499 inclusive.

The only trout stream of importance is Little Bear creek. The fishing is good and the fishermen numerous. The stream is stocked occasionally with yellow trout. Bass fishing and trout fishing may be had in Loyalsock creek. Some trout are found in Wallis run.

Lightning Report.

The number of trees struck and shattered during 1912, is as follows:

	May.	June.	July.	August.	Total.
White pine,	1	2	1	.....	4
Chestnut, .....	.....	1	.....	1	2
Pitch pine,	1	1	1	.....	3
White oak, .....	.....	1	1	.....	2
Rock oak, .....	.....	1	.....	.....	1
Hemlock, .....	.....	.....	1	.....	1
Total, .....	.....	.....	.....	.....	13

During 1913, ten trees were struck and shattered, as follows:

Chestnut,	4
Rock oak,	2
White oak,	1
Pitch pine,	2
White pine,	1
	<hr/>
	10

All occurred in the month of July except one, a rock oak, which was struck during the month of June.

17. THE MINISINK FOREST, NOTCH DIVISION.

Forester, John E. Avery, Notch.

Forest Rangers:

Ferdinand Frank, Edgemere.

William Hatton,* Lords Valley.

Edgar Wilson, Canadensis.

The Minisink Forest includes all the lands in Pike and Monroe counties, the larger portion of the area in Pike county being included in the Notch Division.

The boundary survey, 20 miles, is cut clear to a width of 15 feet. The approximate area of the division is 30,000 acres, 5,000 mature timber, 20,000 with a density of 50%, 3,000 of a density from 10% to 50%, the remainder of varying character, 759 acres are covered with water.

Springs and Streams.

Nearly all springs in this region depend upon climatic conditions. For this reason streams are irregular.

Buildings and Repairs.

Repairs have been made at the house occupied by Ranger Frank, consisting of new fence, repairs to the stream bank, and a concrete walk; water line installed from spring to the house; house repaired

*Began service March 1, 1912.

throughout; barn and out buildings painted. A local telephone line was purchased connecting the ranger's home with Porter's Lake Club. This is intended to be extended 6 miles to the forest headquarters at Notch.

Roads.

During 1912, 8 miles of old roads were brushed out for the first time and 29 miles were re-brushed and repaired. Seven miles of new fire lanes were opened and 24 miles of the boundary line cleaned out. Eight miles of new roads were brushed out and partly completed.

In 1913, roads and fire lines were brushed and opened to the extent of 77.7 miles. Teams may pass on all fire lanes, which are so laid that they may be converted into roads.

Plantations.

Seedling trees planted in the State Forest during 1912, are as follows:

White pine,	3 years,	15,000
Red oak,	3 years,	900
American elm,	3 years,	200
Total,		16,100

In addition to the above, 1,000 Carolina poplar cuttings were planted and 3 pounds of white pine seed were sown in the nursery bed. In May, 1913, 5,000 white pine were planted. To date the total number of seedlings planted within this forest is as follows:

White pine,	35,000
Red oak,	900
American elm,	200
Carolina poplar,	1,000
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Total,	37,100

The red oak and American elm above mentioned were a remnant of a previous shipment held over the winter. They did not do well upon transplanting and the probabilities are they may fail altogether.

Sample Plots.

One small experimental plantation has been made on a burned area.

Labor.

A nine-hour day costs at the rate of 20 cents per hour. Team with driver from \$3.50 to \$4.00 per day.

Markets.

The nearest market is 16 miles, over indifferent roads. The sale of products is not advisable.

Forest Fires.

During 1912, 7 different forest fires burned in this region. Three of them were upon State and private lands, and 4 of them exclusively upon private lands. The fire of May 4th covered 500 acres of State land; that of May 21st, 200 acres; that of November 21st, 900 acres. In the first and second fires young saplings were killed and the forest floor destroyed. The third fire killed some of the young growth but burned only the upper layer of the humus. The origin of all the fires is unknown.

In 1913, forest fire was confined to an area of 225 acres. One new observatory station 38 feet high was built. It cost \$50.62.

Insects and Fungi.

The white pine weevil and a leaf eating worm on the pin oak are prevalent. Chestnut blight exists throughout the area.

Outing and Recreation.

Permanent camp sites within this forest will be numbered from 2701 to 2799 inclusive. Twelve camps were erected during the open season of 1913. Ten deer were taken on or near State land. Birds and other game are not plentiful. Fishing is good and large catches have been made.

Lightning Report.

The trees struck and shattered by lightning during 1912 are as follows:

	July.	August.	Total.
Pitch pine,	2	6	8
Chestnut,		10	10
White oak,		3	3
Total,			21

So far as known, no trees were ignited by the current.

During 1913, 18 trees were struck by lightning during the month of August, as follows:

Pitch pine,	16
White pine,	1
White oak,	1
	<hr/>
	18

18. THE MINISINK FOREST, POCONO DIVISION.

Forester, John L. Strobeck, Cresco.

Forest Rangers:

Stewart Albert, Cresco.

Martin Cortright,* Hunters Range.

The Pocono division comprises 16,056 acres in Pike county and 6,168 in Monroe. On September 1, 1913, H. F. Critchley was assigned as forester to the Hunters Range region for temporary service. Later on he was removed to his present station.

The boundary survey is not complete. Possibly one-half of it remains to be determined definitely. Seven miles of the boundary have been brushed out. The material removed was one-year and two-year growth. The experience is that it pays to brush the lines every year. The surveyed portion of the line is well marked and painted.

There is no portion of the forest with a density of 50% or over. Two thousand acres have a scattered stand of mature and hyper-mature pitch pine, ranging in density from 10% to 50%, in Pike county. This pine is old and fire scarred, and may well be removed. Further delay in marketing is a loss. Eight hundred acres of the division are covered with brush and very little of it will be reforested naturally. About 10 acres of the forest are open and planting can be done with little difficulty. With proper improvement cutting practically this whole forest will regenerate itself naturally. Water covers 50 acres, roads and trails 117 miles, fire lanes 32 miles.

The Cortright property in Porter township, containing what is known as Twelve-Mile Pond, a fine body of water, has been sold

*Resigned September 30, 1913.

into private ownership and consequently into private use. An area, including the lake, has been fenced in as a deer preserve. This cuts off an old road which was formerly used as a fire lane and an entrance into the back country. However, a fire lane is maintained around the entire inclosure, which will be a help in preventing the spread of fires in that region. The new owner is not only careful in the use of his own property, but is interested in protecting adjoining areas from fires. The many hunting clubs owning private preserves in this region may become of great use in the State's work, since co-operation between them and the forest officers will result in a working plan and a mutual understanding of what is desired to be done. They are, of course, most interested in their own holdings; but to a hunting and recreation club the woods are of as great use as to the one who employs them only for the production of timber. The idea of forest protection is, therefore, being extended for the benefit of all who are interested.

Springs and Streams.

The principal springs in the forest have been cleaned, marked, and made accessible; one for the purpose of affording a watering place along the Porter township road; another, the Laurel spring, for fire fighting purposes.

Springs in this region are not numerous. The area is underlaid with hard pan clay, and most of the springs, it seems, find their origin above the clay. The country abounds in swamps and the flow of many springs may be traced thereto. There is little danger of contamination owing to the lack of industries within the region. The only possible source is from camps.

During the extreme drought of summer, the stream flow varies. Many become almost dry which at other seasons of the year are full and rather regular. Saw Creek, a trout stream in Porter township, was dry for a greater part of its course. The pools were the only refuge of the trout.

Buildings and Repairs.

A new residence and headquarters for the forester were built during 1912. Some fencing took in the yard, fields, and garden.

What is known as the Whitaker place, a ranger's home within the State Forest, is in need of repair. The house is small and inconvenient and it is questionable whether it would not be cheaper in the end to reconstruct the buildings.

Two cabins were built during 1913, for the accommodation of the forest staff.

The beginning of a proposed telephone line was made in 1912, the poles being taken out for that purpose. In 1913, the Department assisted in the building of a telephone line connected with the Bell system, running from Porters Lake to Stroudsburg. The line was built from forester's headquarters to Rock Ledge, a distance of $2\frac{1}{2}$ miles, and there connected with the Cresco and Greentown line, a mutual company. The total cost of the new buildings at the forester's headquarters, including the time of the forester and his rangers, which amounted to $2,836\frac{1}{4}$ hours, was \$5,400.11.

Roads.

A good road through this region for the use of the rural delivery post route is highly essential. The character of the roads at present is such as to prevent the establishment of such route. A petition has been prepared to the postal authorities for such service.

One mile of road was rebuilt in the southern division in 1912. The work included the removal of stones, widening of the drive, opening of the drainage gutters, and rounding up the surface. Boundary lines and interior lines serve as bases for fire fighting, and were likewise improved and extended over a distance of about 13 miles.

A total road mileage of 27.3 miles was improved during 1913. The local road supervisors did not do their duty with respect to public roads in the State Forest.

Easements.

During 1913, a new public road was laid out through a portion of the forest, and the Department waived all damages. It welcomed the road in the position it was put as it gives a new outlet to market.

Minerals.

A good quality of flag stone is found within the State Forest, and prior to the time when the Commonwealth acquired title, stone quarrying was a regular industry. The price of the stone gradually declined, and this together with the long haul to market, has for the present made it an unprofitable undertaking.

Seed Collection.

A small quantity of seeds was gathered during the season for special purposes, from 4 to 8 ounces of each kind being taken. The

species collected were sumac, black oak, yellow poplar, rhododendron, mountain laurel, azalea, witch hazel, wild indigo. The collection was sent to the Department at Harrisburg for addition to seed exhibit.

Plantations.

A small plantation of 5,000 3-year old white pines was made in 1912 for the purpose of an experiment. In each clump of sprouts, all but one or two were removed. The idea was to have the strength of the stump enter the remaining sprouts, driving them up rapidly and thus get an area partly shaded within which the young white pines might be able to thrive, this method of preparing the area for planting being much cheaper than an entire removal of sprouts and stumps. The result was that the stumps produced other sprouts than those which were intended to remain, and if the plantation is to be a success, a sprout thinning must be made.

An existing plantation was strengthened by using 1,100 white pine transplants. These were the remnant left in the nursery from a larger stand of the previous year. A few catalpas, at least 60 in number, were grown from seed and are not doing well.

Planting in 1913 used 1,500 Norway spruce, 2-year old seedlings.

The total area of forest land planted to date with seeds and seedlings is 7 acres. The plantings have been as follows:

White pine seed,	1 pound
Scotch pine seed,	1 pound
White pine seedlings,	16,100
Norway spruce,	2,500
Catalpa,	60
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Total,	18,660

Nurseries.

Two small nurseries within this State Forest have been established, the Whitaker nursery in the spring of 1911, and the Albert nursery in the spring of 1910. At first of small size, the area was increased during 1912 to 1,125 lineal feet of 4-ft. wide beds. An inventory of seedlings then present showed the following stock on hand:

White pine, .....2 years,	4,000
White pine,1 year,	74,000
Norway spruce,2 years,	3,000
Douglas fir,1 year,	4,000
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	85,000

Twenty pounds of white pine and one pound of Douglas fir were used for the year's planting.

The soil, in this nursery is found to be too poor, and the nursery was abandoned in 1913. The reason for so doing is the poor soil, lack of water supply, and uncertain labor. At the end of the 1913 growing season, however, it contained the following seedlings, 3,400 of which will be used for the 1914 planting:

White pine,	2 years, ..	14,300
White pine,	1-1 years, ..	6,990
White pine,	2-1 years, ..	3,000
Norway spruce,	1-1 years, ..	3,760
Norway spruce,	2-1 years, ..	1,400
Douglas fir,	2 years, ..	2,400
Total,		31,850

The Albert nursery consists of about 150 lineal feet of 4-ft. wide beds. An inventory of its products in 1912 shows the following:

Black walnut,	1 year, ...	60
White pine,	1 year, ...	1,000
Norway spruce,	2 years, ..	11,000
Norway spruce,	2 years, tr.	1,000
Scotch pine,	2 years, ..	1,000
Total,		24,060

This nursery, being located on private property, will be abandoned when the present stock reaches planting size. The inventory at the end of 1913 shows the following seedlings:

White pine,	1-1 years, ..	1,664
Norway spruce,	1-1 years, ..	500
Norway spruce,	2-1 years, ..	3,275
Norway spruce,	3 years, ..	11,000
Scotch pine,	3 years, ..	13,500
Black walnut,	2 years, ..	33
Black walnut,	1 year, ...	40
Total,		30,012

Sample Plots.

A 2-acre plantation was established in 1912 to determine the tolerance of white pine. The time is too recent to report on the success or failure of the experiment.

Labor.

As in many other forests, labor in this region is scarce. Fortunately no large force of men is required at present. The important improvement was the enlargement of forest headquarters, and this required skilled rather than unskilled labor.

The prevailing price is $17\frac{1}{2}$ cents per hour, and teams receive from \$3.50 to \$4.00 per day. During the summer or boarding-house season, there is a tendency to raise wages. A permanent labor force is a future necessity.

Improvement Cuttings.

Improvement cutting was carried on during 1913 on warrant 64. Such material was removed as encumbered the ground. Another improvement was undertaken on warrant 169 to remove 50% blight killed chestnut. Blight killed timber was also removed from warrant 188 and elsewhere where found.

Market Conditions.

The bulk of the timber going out of this region is for mines. It consists of what is known as mine timber, mine props, mine ties, and a small amount of saw timber, sprags, and lagging. A number of telephone poles are likewise produced. Oak and chestnut are the species yielding the greatest quantity. Utilization is close when the tract is near the railroad. Cord wood may be cut and hauled at a profit when selling at \$2.25 per cord. Mine props are taken down to 6 inches at the small end, and ties and cord wood are made from what remains. There is a continued demand for the above material and the whole region may be said to be pre-eminently a mine supply timber store house. To show something of the needs of the nearest coal mines, one near Wilkes-Barre requires 24 car loads of props of all sizes per month and in all the mines owned by this company, 158 car loads of props from 7 inches to 18 inches in diameter are used every month along with the necessary quantity of mine ties, lagging, rails, and sprags. When one considers the numbers of operating collieries, the demand for mine timber is of huge proportion.

As a result of the demand, the price of mine timber has risen. The Delaware, Lackawanna & Western Railroad is the largest purchaser in the region, and the following prices prevail, the figures in the first column showing the prices paid by dealers who sell to

the railroad, while those in the second column are the prices paid by the railroad directly to the producer:

Mine props, 6 in. dia. small end,.....	\$17 00 per M. lineal ft.,.	\$20 00 per M.
Mine props, 8 in. dia. small end,.....	25 00 per M. lineal ft.,.	30 00 per M.
Collar timber 10 in. dia. small end,.....	50 00 per M. lineal ft.,.	60 00 per M.
Collar timber 12 in. dia. small end,.....	80 00 per M. lineal ft.,.	100 00 per M.
Mine ties, 5' x 4" x 4",	07 each,	08 each
Sprags,	11 00 per M.,	12 00 per M.
Railroad ties, 8½' x 7" x 7"		
White oak or rock oak,	70 each,	80 each
Chestnut,	50 each,	55 each
Oak ties for treatment,	60 each,	65 each
Railroad ties, 8½' x 7" x 6"		
White oak or rock oak,	62 each,	70 each
Chestnut,	45 each,	50 each
Oak ties for treatment,	55 each,	60 each
Railroad ties 8½' x 6" x 6"		
White oak or rock oak,.....	50 each,	55 each
Chestnut,	30 each,	35 each
Oak ties for treatment,	30 each,	35 each
7-ft. trolley ties,	30 each,	
Hickory timber for boat fenders 6 in. dia.		
small end,	18 00 per M. lineal ft.	
Hoop poles, maple 6',	6 00 per M. poles	
Sprag timber in the pole,.....	11 00 per M. sprags.	
Mine ties 5' x 5" x 5",	08 each	

During 1912, other operations being pending, little utilization was carried on. No point of the State Forest is nearer than 6 miles to the railroad, and most of the timberland is at greater distances. One trip a day may be made with teams, and timber down to 5 inches is capable of being utilized. Operations thus far have shown a profit. If labor conditions continue as at present and the roads are improved, a considerable quantity of material now on the State land should be removed for the good of the woods.

The same outrageous rates still prevail over the Delaware Valley Railroad from Bushkill to Stroudsburg, a distance of 12 miles. To move a car of mine ties it charges \$9.50, sawed lumber \$10.50, 6 inch props \$6.00, 7 inch props \$7.00, 9 inch props \$9.00, railroad ties 3 cents each. A much wider market range would be afforded us if the rates on this little road were fairer. In contrast with the Delaware Valley, the D. L. & W. buys and pays for everything f. o. b. cars per unit of measurement, and removes the whole problem of freight charges. Owing to the presence of the chestnut bark disease, there is an over supply of mine timbers. Everyone is disposing of his chestnut in the most rapid manner.

Erosion.

But little erosion is found within this State Forest. Sprout growth is vigorous and is a continual impediment to the action of the rains at nearly all times. On a few hills there are different conditions, and where growth has been cleared off down to what is called a sprag size, some evidence of erosion is seen during the first year, but a year's growth of sprouts speedily corrects the trouble.

Insects and Fungi.

The pin oaks throughout this region have nearly all been killed by the attacks of the leaf blister. This tree is in mixture throughout the entire region, occasionally up to 50%, and the stand is nearly annihilated.

The pine weevil is present and a number of infected shoots have been cut out and destroyed. The chestnut bark disease is present and is the most serious problem. At least 50% of the chestnut stand on State land is infected, and since chestnut forms 50% of the total stand, the damage is evident.

Forest Fires.

This division suffered severely from fire during 1912. There are no nearby railroads. From the location, the conclusion is reached that fires are started by persons frequenting the region, and many of them are believed to be incendiary. There are still present some persons in this neighborhood who claim that great advantages accrue from burning the woods. The difficulty in these woods, as elsewhere, is too few persons for protective purposes. The rangers are but two in number and at distances from each other. By the time they can reach fires, usually they are well started. The disposition, likewise, on the part of the few remaining people to burn out the thickest and best of the woods in order to improve the deer shooting, is one of the problems facing the Department.

There are 4 observatory stations and they serve their purpose well. The forester has completed what he calls a fire warden's outfit, consisting of a coat with water bag attachments, rakes, and buckets, all incorporated in the makeup. It is believed this apparatus will assist in extinguishing many incipient fires.

Mr. John Mack, the owner of Hunters Range, including the Twelve-Mile pond, has placed at the disposal of the forester an automobile, to be used in case of fire, and the transportation thus furnished is not to be confined to fires on State land. His men are also at the service of the Department free of charge. His interestedness in preventing fire is of great advantage and his co-operation highly appreciated.

During 1912, 5 fires are reported, all in Porter township, Pike county, and covering an aggregate area of 360 acres of State land and 560 acres of private land.

In 1913, fires were numerous. Seven distinct fires occurred throughout the season, 6 of which burned on State land over an area of 193 acres. The organization of a compact fire fighting force has

been made and will produce good future effect. Lookouts are maintained during the danger seasons from the fire towers. The arrangement which the State has with the Pocono Protective Fire Association is likely to give good results and the appointment of the forester on this division as District Forester for Monroe county, is assisting very greatly in enabling us to comprehend and meet the entire fire situation.

Outing and Recreation.

The Department granted 9 camping permits for this region during 1912, and the conduct of the campers while on State land was entirely satisfactory. The reports of the season show that 15 deer were killed in the State forest and vicinity. This is a small number compared with former years and when the number of hunters in the woods is considered. There were no tracking snows during the open season and this no doubt contributed to the small number taken.

Seven camping permits were issued in 1913 to a total of 47 persons. Deer are increasing in number, although fewer were taken in 1913 than in 1912. Small game is abundant.

Trout fishing is still a familiar recreation and Mud Pond is a good open fishing ground. The number of fishermen is very great.

All camp sites in this forest will be numbered from 2901 to 2999 inclusive. Thus far 11 sites have been prepared, numbered, and posted.

19. THE MINISINK FOREST, PROMISED LAND DIVISION.

Forester, Milton O. Robinson,* Canadensis.

Forest Ranger, Edgar Wilson, Canadensis.

The Promised Land division of this forest was erected only in the latter part of 1912, and Forester Robinson assigned to it September 1st. His report of activities is necessarily meagre. A part of the work on the division, to-wit, the plantation work, will be found in the report of John E. Avery, forester on the Notch Division.

For convenience of administration, the Promised Land Division is sub-divided into Promised Land and Blooming Grove, the former comprising lands in Palmyra and Greene townships, and the latter lands in Palmyra and Blooming Grove townships.

The boundary survey is complete and all lines are brushed and painted. The total length of boundary is 31 miles. The area of the forest at present is 10,520 acres, with but 100 acres of open ground. That having a density of 50% and over is about 6,000 acres, of which 3,000 are in need of improvement. Eight hundred acres are approximately mature timber. The large scattered trees, chiefly the pines, are interfering with the growth of the younger material. The area having a density of from 10% to 50% is 1,900 acres, consisting chiefly of hardwoods, chestnut, oak, and maple. Less than 100 acres is brush land, and all of it will be naturally reforested with protection. The water area is 1,500 acres. It includes 2 ponds, 6 swamps, 8 streams, and 5 springs. Roads and trails occupy 75 acres, boundary lines and fire lines 115 acres.

Springs and Streams.

The continuous springs have been opened, walled, and made accessible. Streams vary in volume according to season. There is no danger of contamination.

Buildings and Repairs.

All buildings are in good condition, but in need of paint. The construction of a forester's office was begun in 1913. There are no fences except around the premises occupied by the ranger at Promised Land Pond. Three and a half miles of telephone lines have been built. The Department also has the use of two miles of local line in return for furnishing some poles to help build it.

*Resigned October 1, 1913.

Roads.

In 1912 the only road work accomplished was the brushing out of 5 miles of old road. The road system in the division is reasonably good. The two forest roads within the division are 23 miles long, in addition to the township roads. Eight and a half miles were opened and repaired during 1913. All were old lumber roads which were brushed and cleaned out for the first time since they were abandoned.

Plantations.

The division has 12 acres of planted area, principally white pine. Two additional plantations were made in 1913, using white pine and white ash. This planting covers $7\frac{3}{4}$ acres, making a total approximating 20 acres. The following seedlings were planted:

White pine,2-1 years, ...	10,000
American ash,1 year,	9,150
Willow cuttings,	296
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	19,446

Sample Plots.

Two small experimental plantations are being studied. One is the dynamited area, mentioned elsewhere in this report. The other is a plantation of willow cuttings in two plots containing a total of 296 cuttings.

Labor.

A charge of 20 cents per hour is made for labor in this region. Double team with driver costs \$3.50 per day. There is at all times a scarcity of labor in this part of Pike county. When the summer colony appears, labor is eagerly sought for and higher wages are offered for the limited time the service is needed than the Department has been accustomed to pay. To meet the situation the Department must be prepared to meet all conditions if it is to have a regular supply of labor when there is need for it.

Improvement Cuttings.

One cutting is in progress but not sufficiently advanced. Some hypermature hemlocks and spruce, with scattered pine, are being removed from a swamp. No other improvement work has been done except the removal of dead material.

Market Conditions.

At present the market in this region is poor, the matter of transportation being solely by team over the public roads. The distance to the nearest railroad is 14 miles. There is sale for nothing but sawed lumber.

Insects and Fungi.

The division has suffered greatly from the attack of the chestnut bark disease. The white pine weevil is prevalent and the pin oaks are being destroyed by the attack of another insect.

Forest Fires.

There were no forest fires on this division during 1912. But two fires burned upon State land during 1913, covering 200 acres. Two hundred and fifty acres of private land burned. The loss was severe and the origin unknown. Two fire towers have been erected and one tree-lookout. Telephone lines connect the towers.

Outing and Recreation.

Six camps were erected within the forest during 1912, affording accommodations for 35 campers. So far as known, but 3 deer were taken on State land.

Twenty-five camping parties were within the division during 1913. Fishing generally is good in the ponds and streams. A great many hundreds of people, chiefly fishermen, come for a day only. By actual count nearly 1,200 persons availed themselves of the use of this part of the State Forest for outing, hunting, fishing, and general recreation during the year.

20. THE McCLURE FOREST.

Forester, John L. Witherow, East Waterford.

Forest Ranger, G. Frank Mohler,* Honey Grove.

The McClure State Forest is named in honor of Hon. Alexander K. McClure, and is situate in the extreme southwestern corner of Perry county, in the townships of Jackson and Toboyne. The region is one of deep, narrow valleys having the same general direction. These are nearly surrounded by great mountains and valley ridges giving the country a rough contour, and making access to the inclosed settlements and the interior of the region very difficult. On account of this condition and other greater agricultural disadvantages, the area covered by the several interior settlements has been decreasing annually for a number of years, and it is generally conceded that the greater portion of the land once occupied will again be given over to forest growth.

The land touching the outer boundary of the forest is generally covered with forest growth for some distance, but beyond this on all sides is an agricultural region having populous settlements, and industries more or less prosperous according to the distribution of resources, and the available means of transportation.

Lumbering of the present area of 6,093 acres comprising the forest, was first begun about 1870, by annual winter cutting of only the finest specimens of valuable species. Water-power saw mills were set up in the interior along the forest streams to cut out construction timbers from white oak and white pine, and the hemlock was cut chiefly to produce bark for the small tanneries nearby. At the time of these operations railroads were twenty miles distant, clear cutting was little practiced, and no great inroads were made upon the forest until 1880, when steam mills and circular saws were brought into practice, clear cutting all growth then merchantable on certain tracts. These methods were continued from 1880 to 1891, in which time a large area was cut clear and much of the remainder was thinned of its best growth. Following these operations, little cutting was done until a railroad was built into the interior in 1905 to facilitate a speedy, general lumbering of the entire area. This was carried forward until 1909, when on account of conditions unsatisfactory to the lumbermen, the work was stopped before being fully completed, leaving a considerable area upon which no cutting has been done for about 30 years.

*Resigned September 30, 1913.

The comparatively good condition of the forest at present is due chiefly to the infrequency of forest fires, and to the difficult and costly transportation in early lumbering.

In 1910, the State came into possession of this region and fires have been completely suppressed since that time.

The forest staff has never consisted of more than one ranger and the forester. One ranger was employed for the first nine months of 1913, but during the last three months the work was carried on without assistance. A labor force of four to six men has also been employed more regularly this year with fairly good results.

Under present conditions unfavorable for work, all operations are carried forward only with maximum effort and it is difficult to maintain a high standard of efficiency among laborers, or to carry out any systematic program of operations. The length and topography of the tract, poor roads, and a scarcity of laborers, all contribute to this undesirable situation. Conditions would be improved by a good road system, but at present without telephones or any other means of communication, it is difficult for one or two men to carry on steady operations, in addition to the purely administrative and protective work connected with the forest. The value of the growth and land under management is sufficient to permit the regular employment of two rangers.

The boundary survey is unfinished, although 35 miles of lines have been established and marked by blazing and stone corners. All have been reblazed and painted. The total boundary line is $43\frac{1}{2}$ miles.

The area comprising the McClure forest contains 6,093 acres, purchased in 1910. There is no virgin growth except a few over-mature chestnut and rock oak. Eight hundred acres are covered with a stand near maturity. One-half of this is thin. It includes chestnut, rock oak, red oak, black oak, and white oak, some yellow poplar, white pine, and locust. Much of it is short, crooked, and branchy. Two thousand three hundred acres are covered with a growth having a density of about 50%; 1,300 acres are not in need of improvement. The remaining thousand acres require improvement cutting. A density of from 10% to 50% is found on 2,200 acres, carrying about the same species above mentioned. Nearly every portion of this area is being reforested naturally. A worthless growth of damaged trees and shrubs covers 338 acres. Natural regeneration is good on 200 acres of this area. Cleared land throughout the forest amounts to about 200 acres. It must be cleaned before planting. The remaining 255 acres of the forest area is taken up with 200 acres of rocky surface, 15 acres of water, 39 acres of roads and trails, and one acre of fire lane.

Springs and Streams.

The surface rock in this region being sandstone, a number of fine springs at the base of the steep mountain slopes and some on more elevated land are found. The flow is regular and they receive little or no surface water and are the best springs in all this region of the State. Since lumbering has ceased the small springs in the bottom of the valley are not in good condition. The flow varies since the removal of forest cover, and some have been filled with wash and slashings. Twenty of the springs have thus far been cleaned and improved. A number of mineral springs are found rising from the deep strata, and contain principally sulphur and magnesia. The taste and odor of the water are not agreeable until one becomes accustomed to it. The water from the mineral springs is pure and cold and not subject to contamination. "Lost" springs are recovered occasionally.

There are 4 main water courses within this forest, Laurel Run, Blain Run, Kansas Creek, and Horse Valley Creek. The streams are free from sand and the flow is reasonably constant except in extreme drought or a season of rapidly melting snow. At present slight contamination from the old lumbering sites and the valley settlements is present. Laurel Run and Blain Run are more constant in flow and are not subject to the contamination which at present affects the other two.

Buildings and Repairs.

This State Forest contains 2 small farms, the buildings on which were dilapidated and poor. Repairs were made during 1913 so as to make the buildings usable for State purposes. Fences were repaired, obnoxious weeds and brush cut and removed from around the buildings, and a cleared area established around them. Both farms at present are occupied by tenants.

Two long distance telephone lines cross the State land from east to west, and the Ohio Oil Company's line crosses the central portion near East Waterford. Another pipe line passes over the northern extremity of Liberty Valley. Both pipe lines are such that they are useful in forest management, and if extra wires could be strung along them, would be of much use in administration.

Roads.

The roads in this forest area are in poor condition throughout the year. Grades are bad and proper drainage is lacking. It is a fact that a 2-horse team can earn for its owner but \$1.25 per day

in hauling loads over these roads in winter. The marketing of all products and the cost of reserve operation, it will be seen, are directly dependent upon the road condition.

The above applies more particularly to the township roads. There has never been sufficient money available from any source to keep them in good repair. Those within the State Forest are in better condition, but not yet entirely satisfactory. Some must be re-located and are simply being kept in repair because needed. A new road system already planned will reduce the number of minor roads and of public roads. When once in good repair transportation by team will not be difficult or expensive.

The total number of miles of old roads which have been improved is 13 miles. In addition to this, 1 mile of special fire lane has been constructed.

Easements.

The Ohio Oil Co. owns a right of way 20 feet wide through the central portion of the forest east and west. The company maintains a narrow path 3 feet wide in good condition for travel, but this affords little use in fire protection.

Minerals.

So far as known, valuable minerals or other products have never been mined in commercial quantities from any land now included in the forest or anywhere in the immediate territory. However, it appears that old settlers believed there were valuable deposits and did much prospecting, while present inhabitants still hold to this idea. It is not known just exactly what gave rise to this belief, and one might easily conclude that it was poor agricultural possibilities.

Without regard to any mining history one thing is true of the region: That the geological structure is a peculiar one, and which, it seems, has not been explained to the satisfaction of all geologists. Some authorities have come into the region at different times to study it for themselves.

About the year 1900, a stock organization was formed known as the Union Oil and Gas Co. This company was supported in part by local capital, and extensive operations were carried on for some time in an endeavor to locate oil and gas in the Tuscarora valley, at points not far distant from the forest boundary. During the progress of the work three wells were drilled to depths ranging from 1,000 to 2,600 feet, and natural gas seems to have been tapped by two of these wells. This was an event causing much excitement, capi-

talists from a distance were favorably impressed, and land for miles around was leased for the oil and gas rights, but the work was continued for some time with poor results, and after some mismanagement of the company's affairs the project was abandoned without anything resulting from it.

During the past two years a corporation has been trying to locate beds of iron ore on an adjoining tract, at great expense. So far no large quantities have been found, but the outcome of the work is being watched with interest, since it is believed that this will determine the extent and practicability of mining operations for a long time to come.

Seed Collection.

There are not many good seed trees in this forest, and good seed crops, therefore, are not to be expected. The scattered situation of the trees makes seed collection too costly except when it may be gathered during the progress of improvement work. To test the cost of seed gathering, one pound of white pine seed was collected during the fall of 1912, but the cost of getting it amounted to \$4.57, a price at least three times too great. Six bushels of rock oak and 3½ bushels of white oak acorns were likewise collected. The former were of good quality but the latter worthless. All were used in plantations.

Plantations.

The number of seedling trees planted during 1912 was 25,000 white pine, and the total number of seedlings planted to date within this forest area is 60,000 white pine, covering 18 acres.

The growth is thrifty, ranging in height from 5 to 18 inches. Since reinforcing, less than 1% of the total planting has failed. In addition to the above, 9½ acres have been planted with 6 bushels of rock oak and 3½ bushels of white oak acorns. The long drought prevented rapid growth of the oaks, but at the end of the season they had an average height of 4 inches with 65% stand.

Labor.

Labor costs from 13 cents to 16 cents per hour, most of it 15 cents. Occasionally 16 cents per hour must be paid. Extensive operations demand the bringing of men from a distance, as the local supply is not sufficient. Two-horse teams with driver cost from 30 cents to 32 cents per hour. The price usually demanded is 40 cents. During the height of the farming season it is scarcely pos-

sible to find a team available anywhere. Since the lumber industry has disappeared, those formerly engaged in the business of teaming, have abandoned it.

The quality of the labor which offers is below the average usually found in our forested regions, and increase of wages does not seem to bring increase in efficiency. The reserve distances are such that it is inconvenient at times for men to live at their homes and reach their daily work where operations are carried on. For this reason it is necessary to have permanent reserve camps where men may be accommodated.

Market Conditions.

Local markets are poor. The lumbering industries nearby supply the local demand and the balance goes into distant markets. Railroad ties, pulp wood, locust pin wood, hickory handle wood, chestnut staves, and chestnut and yellow pine mine props are called for but are not used locally. The best standard railroad ties sell for 65 cents. The market for extract wood has been destroyed by increased freight rates by the local railroad. Delivered at the road it sells for from \$4.00 to \$8.00 per cord. Locust for pin wood is worth from \$5.50 to \$6.50 per cord. Select hickory for handle making is in demand at \$12.00 per cord but is not profitable because of the want of close utilization.

For paper wood the market will accept beech, birch, poplar, black willow, pitch pine, yellow pine, and maple. It is worth from \$4.50 to \$7.00 per cord, but must be peeled and counted 160 feet to the cord. The demand for paper wood is increasing and the price will likely rise.

Of the hickories, not all species are accepted, and the material used consists of the butt cuts, which must be free of knots or other defects and from 50 to 52 inches long. For this material there is a good demand at \$12.00 per cord. Since a close utilization of the tree is not made, the price would not average much greater than some of the other woods.

The demand for chestnut and pine stock for slack cooperage staves is good. An operator must have an equipment of his own to produce this material, but the mills in the region are not often in want of raw material.

Transportation facilities are not good, but with better roads, lumbering could be carried on with more profit. The main outlets from this forest are north and west. The whole product must pass over one railroad and three public roads. When the forest is sufficiently opened and roads improved, a large quantity of products from this area can be moved at a profit.

Erosion.

No serious erosion is occurring in most parts of this forest. The brush cover supplies a fairly good forest mulch, and the looseness of the soil and underlying rocks permits rapid absorption and percolation of the water. There are numerous small drainage basins and a sudden large flow of water does not occur. Where the forest stand is thin and the humus nearly wanting, the high absorptive capacity of the coarse soil takes up the larger part of the rains. Under the old agricultural methods in the region, erosion on cultivated land was common, even though it had a low gradient. With the abandoning of these poor lands and the growing up to a brush cover, erosion is disappearing even from them.

Insects and Fungi.

The chestnut blight is present and probably 35 per cent. of the chestnut stand is infected. The cutting out of diseased trees has been carried on systematically. The resulting material where marketable is sold. A total of 2,437 infected trees has thus far been destroyed.

Private owners did not pursue the disease with the same vigor that was used within the State Forest. Many are not in financial condition to undertake the work at all, so that delay has ensued and infections have spread. It is useless for a few to destroy the disease if others will maintain propagating beds without any effort to eradicate.

The white pine weevil has appeared and has done considerable damage to some of the young pines. It attacks also the pitch pine. In some stands nearly all the terminal shoots have been killed and some of the trees have assumed a low and irregular form of crown growth. If their attacks continue it will be necessary to undertake the destruction of the broods.

Forest Fires.

Only one fire occurred in the State Forest during 1912, although there were three in privately owned tracts nearby, and all were caused by hunters. The area of State land burned was trifling and the damage may be placed at almost nothing. The area of private land burned in the other fires does not extend in the aggregate to more than one-eighth of an acre.

But one fire occurred during 1913 within this forest, covering not more than 1-12 of an acre, and was started by tramps. There is a growing sentiment in the region against forest fires.

Trespass.

There are not many violations of the forest laws in this region, but the game and fish laws are frequently not observed. Several such latter offences were committed during the year. As they usually take place at night and at a distance off in the forest, the guilty persons are never known.

One case of trespass was settled in 1913, where a lumberman mistakenly cut over State boundary and took a few trees.

The grazing of stock has caused some trouble in the State Forest, but the damage was very slight. The cattle occasionally break away and enter the State land before the owners can round them up. Formerly many persons used the area now embraced in the State Forest as a public grazing ground, but nearly all who have cattle have receded from their position on this question and observe the rule respecting grazing.

Outing and Recreation.

This forest area is chiefly used for hunting purposes. Most of the hunters prefer to live in the farmers' houses and do their hunting in the nearby region. Those who come from the cities and from a distance are known to violate the rules with the least hesitancy. Their habit is to leave their dogs with farmers over the closed season, and because of the half-starved condition to which these dogs are reduced, they roam in the woods in search of game at all times.

This region is used by almost no one except hunters. Nearly all these stay with farmers and hunt during the day on State land. No permits are, therefore, required. Game has been abundant but the woods are over-crowded with hunters. 20 camp sites have been located near good springs. All are marked and numbered. All camp sites within this forest will be numbered from 2,501 to 2,599 inclusive. The mineral springs at the Hockenberry farm attract a number of visitors. With better means of ingress, there is promise of greater usefulness of these lands for recreation in the future. There are many places of great natural beauty and the landscape is highly diversified. The Alcorn buildings are believed to be the site of the first settlement by white men in the region. The first mail route from Perry county to the west and northwest was through this forest, and a portion of this route is now developed as a main forest road.

Good trout fishing is found in the forest streams, but the fish stock has run down rapidly and the streams need stocking.

The Hockenberry farm is used as an outing ground, and at least 200 persons during 1913 visited it for the sake of a day in the woods and the use of water from the mineral springs. Snow and ice under

the dense hemlock groups in the gorges do not disappear until May. The views to be had from the high points in the mountain are unusually good. The diversity of landscape may be said to be unsurpassed.

Lightning Report.

Trees struck and shattered during the year are as follows:

	June.	July.	August.	Total.
Chestnut,	11	4	.....	15
Rock oak,	7	1	.....	8
Black oak,	1	.....	1	2
Sour gum,	2	.....	.....	2
Red maple,	2	.....	.....	2
Yellow pine,	1	.....	2	3
White pine,	1	1	.....	2
Total, .....	.....	.....	.....	34

No trees were ignited after being struck.

Twenty-three of the above trees struck in June were killed and all stood upon one-tenth of an acre. The killing of these trees resulted from two strokes. It is not unusual to see groups of 5 or 10 trees killed by a single stroke. It is found that more trees are struck on elevated land than those which stand in the valleys.

During 1913, 17 trees were struck and shattered, the periods of frequency being

June,	2
July,	13
August,	2
Total,	17

The species struck were:

Chestnut,	7
White oak,	3
Yellow pine,	3
White pine,	1
Sour gum,	1
Red oak,	2
Total,	17

21. THE HOPKINS FOREST, McELHATTAN DIVISION.

Forester, Joseph R. Hogentogler, Rosecrans.

Forest Rangers:

Adam Kamp, Lock Haven.

Henry M. Jameson, Loganton.

The McElhattan Division of this forest is situate in the south-eastern corner of Clinton county, and portions of its area lie in the townships of Castanea, Wayne, Crawford, Green, Lamar, and Logan. The total area is about 12,000 acres, lying in 4 larger tracts and several smaller ones. Access to the division is had at the towns of McElhattan and Pine, both of which are stations on the Philadelphia and Erie Division of the Pennsylvania Railroad.

For the purpose of administration, this division has been subdivided, Ranger Kamp having the lower portion, and Ranger Jameson the upper.

The boundary survey is nearly completed, with lines brushed and painted. The remaining lines must be definitely located before any fixed plan of management may be adopted.

In addition to the topographical description of this forest contained in the report of this Department for the years 1908-09, page 147, additional data respecting climate have been procured during 1913.

The climate in this region can best be shown in the following table. Early and late frosts are common. The following table consists of the average monthly readings:

Month.	Degrees.
September,	68.7
October,	56.3
November,	43.8
December,	35.1
January,	31.9
February,	35.2
March,	40.0
April,	51.4
May,	64.7
June,	72.6
July,	79.4
August,	76.1
September,	67.3

The mean temperature for the year was 55.6 degrees. Not having any means of catching the rainfall, no data were obtained covering the precipitation for the year.

The growth on this area which has been recently cut over is such as is ordinarily on recent cut over lands. Every available piece of wood was removed by the lumberman. Many of the hillsides were left bare of growth. Following the lumbermen came the inevitable fire, and this has left but scrub oak, bracken, and huckleberry bushes on a considerable portion of the tract. However, several stands of good yellow pine are found, one on the Cherry Run tract at the point of Matter ridge. Another is at the mouth of Spring Run along McElhattan Run, where the stand is hemlock, and another on the steep side of the mountain above a great mass of boulders. Its value is protective rather than commercial.

Some of the best stands average 5 inches in diameter and 40 feet in height. The growth has been so luxuriant that it needs thinning. The timber here grows rapidly and the forest will rank high as a producer of good trees.

This is a hardwood region, mixed with some conifers. Chestnut oak and chestnut coppice are the prevailing species. The area of the mature or hypermature forest is small, not more than a hundred acres, and contains chestnut, yellow pine, and hemlock. The area having a density greater than 50 per cent. is likewise small, comprising but a few hundred acres. This area needs improvement thinning, and would be benefitted by having it immediately. The area having a density of less than 50 per cent. comprises the greater part of the forest. Scrub oak is abundant and other forest weeds. The growth is rapid and with protection the weeds will rapidly be crowded out.

Springs and Streams.

This forest is well watered and the mountains are broken up into numerous deep water courses. The city of Lock Haven receives its water supply from the runs within the State Forest, a supply not excelled by any other city in the State. About 10,000 acres of the area is covered with a forest growth of various ages, and the result is a steady stream flow throughout the year. Three-fourths of the whole watershed of the region is owned and controlled by the Department and the city of Lock Haven. The flow of the streams on the southern part of the reserve is likewise fairly regular, the forest cover being good. There are but few springs of value within the State land, but these have been cleaned and made accessible.

Roads.

Roads are numerous and run in all directions. They are divided into major and minor. $1\frac{1}{4}$ miles of the old Nittany road were brushed out for the first time, during 1912, and $\frac{1}{2}$ mile was improved as a

plantation boundary line. 1½ miles of fire lane also was opened to give protection to the plantation. Many of the old roads which were opened by the former forester, Mr. Dutlinger, have since grown shut and will require rebrushing. At least 15 miles of old fire lines are in this condition.

During 1913, 25 miles of old roads and fire lanes were opened. The fire lanes are to be extended the coming season. All fire lanes are so constructed that they may ultimately become roads.

The present forester began his service on this division September 1, 1912, and because of the short time he has been present, road work has not been extended to the degree that might be expected. Much of his time was occupied with other work.

Minerals.

There are a few outcrops of ganister rock. No other minerals of value are known to exist.

Seed Collection.

Seeds of 14 different species growing in the neighborhood were collected and forwarded to the Department for the seed exhibit. Not over one-half pound of each kind was collected for the purpose.

Plantations.

No trees were planted on the division during 1912. The previous plantings amount to 215,032, distributed over an area of approximately 200 acres.

During 1913, planting was made in the scrub oak in the east end of Nittany mountain, using 85,000 3-year old white pines. 5 pounds of white pine seed and 5 pounds of European larch were used in making spot plantations along streams, in old mill sites, and open places. Seeds were placed in alternate rows so as to make a mixed plantation of the pine and larch. 8 acres of land were so treated. The total area planted to date within this forest is 218 acres, including both seedling and spot planting. Seedlings planted to date are as follows:

White pine, 2-years,	200,000
White pine, 3-years,	86,250
White ash,	3,875
Red ash,	3,950
Sugar maple, 1-year,	4,000

Sugar maple, 2-years,	1,075
Red maple,	757
Honey locust,	125
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Total,	300,032

Seed planted is as above set forth.

In some cases the white pine seedlings made a growth the first year of 12 inches.

Labor.

Labor costs 17½c. per hour. Local farm labor costs the same. Team hire with or without driver costs from \$3.00 to \$4.50 per day. The distance to and from work is a great drawback in this forest. The need of having the men near at hand was shown during the season by the forester procuring at his own expense a camping outfit. The additional work they were able to do justified this expense.

Market Conditions.

The forest is centrally located and has wood industries nearby, the paper mill at Lock Haven and the chemical works at Newberry. Pulp wood sells from \$6.50 to \$7.00 a cord delivered. Chemical wood is worth \$4.50 per cord. Freight rates are from 75c. to \$1.00 per cord. The distance from the railroad of a portion of the forest is some drawback to the easy handling of the product. Township roads are ill kept. Dead and down yellow pine timber is worth \$8.00 per thousand. Dead chestnut coppice 50c. per cord. The removal of both would benefit the forest.

Insects and Fungi.

The chestnut bark disease is within the forest. 600 trees have been cut and destroyed. Every tree thus far found has been cut and burned.

Forest Fires.

But one fire occurred on State land during 1912. The ground was moist due to recent snows, and little damage was done. The area burned was about 100 acres, and only the top layer of leaves was destroyed.

A fire covering 5 acres on private land occurred in November. The only serious resulting damage was the burning of fences.

Seven fires occurred during 1913 on or near the forest, 5 of them on State land. The damage in each instance was 50 per cent. or over. The completion of the fire protective service is the most necessary thing in this region at this time. The area of State land burned amounts to 1,900 acres.

Outing and Recreation.

Hunting is done only by local people, few campers coming into the forest. This is because of the absence of good springs as a water supply. So far as learned, during the 1912 season, 10 deer, 4 bears, and large numbers of pheasants and rabbits were taken in this vicinity.

Seven deer and 4 bears were taken during 1913 season. Rabbits and pheasants were abundant. Trout fishing is good in McElhattan and Cherry Runs.

22. THE NITTANY FOREST.

Forester, Harry J. Mueller,¹ Bellefonte, R. D.

Forester, Jesse M. Houtz,² Bellefonte, R. D.

Forest Ranger, Howard E. Wells,³ Pleasant Gap.

This forest, formerly known as the Green's Valley tract of the Central reserve, lies in Spring, Potter, Walker, and Gregg townships, Centre county, and contains 4,145 acres. The boundary line has been completely surveyed and was repainted during 1912.

The hypermature area does not exceed 500 acres. Many of the trees are fire scarred. The hardwoods prevail. Because of the open grown character of the region, the trees are branchy and little good lumber could be obtained. There is sufficient wood, however, to warrant the setting up of a saw mill. With the completion of a road under construction, transportation will be easy and the market is waiting for the product. An area of 1,500 acres is covered with a density of more than 50 per cent. Some thinning in this area is required. 1,000 acres have a density of from 10 per cent. to 50 per cent. and is composed principally of the usual brush. Some of the material may be disposed of as fire wood. Probably 200 acres of land could be planted at this

¹ Left service October 1, 1913.

² Began service September 1, 1913.

³ Resigned March 31, 1912.

time. 10 acres should be reinforced. Nearly 1,000 acres are covered with rocks, where little regeneration can be expected. Swamps occupy 400 acres, but at places it is sufficiently dry to carry a good growth of white pine and hemlock. 20 acres are used for roads and trails, 5 acres for fire lanes.

Springs and Streams.

From time to time springs have been cleaned out and walled up. Fully a dozen have been so treated. They apparently have a steady flow and hold up well throughout the year. Stream flow is continuous. Contamination is at a minimum.

Buildings and Repairs.

The forester's home was in need of a number of repairs, and these were made from time to time during 1912. Fences were built and a general cleaning up of the whole place was made. The house was painted and a drain laid to carry off surface water. A small building was put up in the rear of the old buildings to serve as a general workshop, wood house, and wash room. Certain repairs are still needed to roof and chimney and to the roof of the barn, and the remainder of the buildings should be painted.

A main line of telephone crosses the mountain between Centre Hall and Pleasant Gap at a point 2 miles from the forester's house. A connecting line is being built to reach the Bell system. A nearby commercial company affords better rates.

Roads.

Four miles of roads and fire lines were brushed out in 1912, for the first time, not having been opened since they were abandoned 20 years ago. The total number of drivable roads open at present is $9\frac{1}{2}$ miles. Trails, fire lanes, and boundary lines aggregate $3\frac{1}{2}$ miles. A new road is now in course of construction. 500 yards have thus far been covered. Still other work must be done in order to make this portion of good traversable character. The brush was cut out of the Nittany road for a distance of $2\frac{1}{2}$ miles. The road when extended will pass over the land of three individuals, who will be benefited thereby.

Plantations.

The plantations formerly established by Forester McNeal and Ranger Wells are making satisfactory growth. 65 per cent. of the trees are in excellent condition. Some of the young Scotch pines made

a growth of 20 inches a year. A re-inforcement of the plantation is required where there have been failures of considerable size. No planting was done in 1913.

Nursery.

A small nursery heretofore established contained in the spring of 1912 about 50,000 one-year old seedlings. Because of their crowded condition it was necessary to transplant them. A number were lost by being eaten off just below the surface of the ground by some attacking insect.

Two pounds of white pine seed and two pounds of Norway spruce were sown when the beds were prepared. Germination was poor and the planting not a success. Rains are unusually frequent in this region and moisture conditions must be reckoned with in doing any work of this character. The site will be changed when a more suitable place is found for it.

Labor.

Various large operations in the county attract all the available men, as they pay better wages than the State formerly paid. Farmers are required to pay \$2.00 per day and board the men in order to get their services during harvest. Men who worked during 1911 for 15c. per hour now require 17½c. Teams hired then for \$3.50 per day with driver, now cost 40c. per hour. Even then they require time in going one way, either to or from work.

Markets.

A good market exists for chemical wood, ties, and posts. The absence of a good road makes it difficult to reach.

Erosion.

A striking example of erosion in this region is at the lower end of Green's Valley near the pike. A mass of gravel and rock 20 feet high is piled in the bed of the stream, having been brought down out of the water gap since the removal of the timber. Rocks elsewhere are laid bare.

Insects and Fungi.

The chestnut bark disease has been found within the forest. About 900 trees are known to be included in the affected area, covering about 10 acres, and a small group of infection has been found near the forester's headquarters. New infections are occurring. The saw fly is attacking some of the pines.

Forest Fires.

On June 1, 1912, a fire started a mile east of the forester's headquarters, and before it could be extinguished, burned over 500 acres. Telephone connection would have enabled us to stop it before it had covered 100 acres. The young sprout growth was killed and the humus destroyed.

There were no forest fires within this forest during 1913.

Onting and Recreation.

This forest is much frequented by fishermen who spend the day along Fishing Creek. No camps were erected on State land during 1912. 1,600 large trout from the Pleasant Gap hatchery were put into the streams during the season. It seems that most of these have worked themselves down into the stream toward Lock Haven. Nearly all the trout caught during this season were small in size. The restoration of a small dam east of the forester's headquarters will afford a breeding place which the fish do not now have. The running of game by dogs is altogether too prevalent and the owners have been notified to keep their dogs tied up at home. Small game is abundant.

Lightning Report.

During June and July, 1912, 5 trees were struck by lightning. None were ignited by the current. The species struck were as follows:

Chestnut,	3
White oak,	1
Hemlock,	1
	<hr/>
	5

23. THE PENNYPACKER FOREST.

Forester, Harold E. Bryner, New Germantown.

Forest Rangers:

Herman N. Hart, New Germantown.

Frank P. Sundy, McCrea.

Leroy Koontz, New Germantown.

D. K. Meredith, Doylesburg.

The Pennypacker Forest comprises an area to date of 24,700 acres, and is situate partly in Perry, Franklin, and Cumberland counties. The forest at present is divided into 4 ranges, each in charge of a ranger, who gives his entire time to the work.

The survey of the whole area is not yet complete. Work had to be suspended in 1912 after 12,851 rods of line had been completed and well marked. Many of the boundaries are nearly obliterated and there is difficulty in locating them. This is also true of the boundary line between Perry and Cumberland counties.

During 1913, 11,306.3 rods of boundary line were run and marked.

Springs and Streams.

Along the lower slopes of the mountains and the mountain benches, springs are numerous. There are a greater number on the southern slopes than on the northern, although the water in the springs on the northern exposure is colder and apparently better. Some of the springs are intermittent and disappear during the summer season. Many of them have been cleaned and walled up. Wherever constant springs are located, they are cleaned and walled up by the rangers as time permits. To date 81 springs have received this treatment. There are few springs on or near the summits of the mountain. The springs have not yet been posted in the way which will be done, but when near a road or trail a tree is marked in such a way as to guide towards it. Where there is no trail to a spring, one is opened. Streams are free from contamination but show the effect of drought. A better humus cover which is coming on it is believed will regulate the stream flow.

Buildings and Repairs.

The buildings occupied by the ranger in Henry Valley are in poor condition and should be replaced by new ones. There is sufficient

old material in the neighborhood to rebuild. Other buildings are located on the Three Square Hollow range, the Westover lands, the Fry tract, and the Quay tract. Some are in satisfactory condition, others are poor and should be removed. A telephone line was built to the ranger's house in Henry Valley and such repairs made there as were absolutely necessary. The line mentioned connects with Perry county line at Couch's store, south side of Sherman's Valley. The route is somewhat irregular because of desirability of keeping on State land. The line is metallic circuit $3\frac{1}{2}$ miles long. Perry county companies charge \$12.00 annual rental. This gives service throughout the county. The Department keeps its own line in repair. The right of way was carefully cleared to a width of 20 feet. The building of this line was difficult because of the rocky surface and steepness of the mountain.

Roads.

During 1912, $4\frac{1}{2}$ miles of old roads were brushed out for the first time and $4\frac{1}{4}$ miles of old roads were brushed or repaired.

In 1913, old roads were improved to admit of travel. Several old trails were opened and new fire trails built. For general protective measures, the system is nearly finished. The miles of usable roads and trails total 77.67.

Seed Collection.

14 bushels of black walnuts were collected in 1912 on Ranger Koontz's area. The seed was of medium quality only, but was planted on the reserve in localities where walnut will do well if satisfactory stock can be started.

In 1913, 16 bushels of black walnuts were collected near Ranger Sundy's house. These will be planted in Henry Valley during the coming season.

Plantations.

During 1912, 35,980 seedling trees were planted in this forest, of the following species:

White pine,	200
Black walnut,	1,180
White ash,	5,600
Red oak,	29,000
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Total,	35,980

The total number of acres planted during the year is $14\frac{3}{4}$ and $4\frac{1}{4}$ acres were planted with seeds, on which 30 bushels were used.

Some plantings suffered during the drought of the 1913 summer, a small portion to the extent of 30 per cent. Willow cuttings are doing well and show 98 per cent. growth. The white pine shows 95 per cent. growth. 12 bushels of black walnuts were sown on an area by the ranger in Henry Valley. The seed was poor and only half of it germinated, but more is expected to appear the following year. The area planted with seedlings to date is 85 acres. Planted during 1913, 18 acres; reinforced during the year 3½ acres. Seedlings planted to date number 226,430. Seedlings planted during 1913, 50,000 white pine. Cuttings planted during the year 4,500 black locust; to date 7,500. Area planted with seed to date is 20.3 acres.

The total plantings within this forest to date are as follows:

White pine,	154,200
Scotch pine,	1,550
Balsam fir,	500
Honey locust,	2,575
Norway spruce,	3,000
White ash,	24,900
White oak,	1,925
Red oak,	35,100
Black walnut,	2,680
Carolina poplar cuttings,	1,000
American green willow cuttings,	2,000
Black locust cuttings,	4,500
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Total,	233,930

The plantations made in the following manner have been a failure from a variety of causes: Among these may be included unfavorable weather, poor stock, poor soil, and peculiar local conditions.

4 plantings with seed were made as follows:

20 pounds white pine were used in March and April, 1909, to plant 11 acres of old fields.

2½ pounds of catalpa were planted in April, 1910, on ¼ of an acre in the spent bark of an old tan yard.

2 bushels of red oak acorns were planted in April, 1911, on ½ an acre of old fields.

½ bushel of red oak acorns were planted in May, 1911, on ⅓ of an acre, part of an old field.

The following seedlings which were used in plantation work likewise failed because of the conditions named:

500 balsam fir, 2-year old, planted in April, 1909, on an area of ¼ of an acre in an old field.

2050 1-year old white oaks, including a few red oaks mixed with them, were planted in November, 1910, on $\frac{3}{4}$ of an acre on an old, well-drained field.

The following cuttings, being the whole number enumerated in the above plantation work, were likewise failures:

1000 Carolina poplar cuttings planted in April, 1909, on half an acre of meadow land. This land proved to be too wet for the purpose.

2000 American green willows planted in April, 1911, on an area of $\frac{1}{2}$ acre, being prepared ground of open field. A few are still living but the results are so poor that the effort is regarded a failure.

Nurseries.

In order to take care of a quantity of 2-year old white ash seedlings received from the Asaph nursery, a small bed was prepared into which the seedling trees were transplanted in the spring of 1912. 6,400 seedling trees were thus cared for. 5,600 survived. Many were heaved up by the frost during the winter and terminal shoots frozen in June. They were planted permanently in the spring of 1913.

Labor.

The labor problem is difficult. With insufficient work to give regular employment, laboring men go elsewhere. Wages have risen during the last two years to 15 cents per hour. Teams are worth from \$3.00 to \$4.00 per day.

Improvement Cuttings.

The whole forest is in need of it. Little has been done because of lack of market. A great number of fire scarred and hypermature trees are scattered over the forest and should be removed because declining. A portable saw mill would take care of this situation. Over one million feet of hemlock, oak, yellow pine, and chestnut are thus available.

Markets.

The market is not good because of its distance. There is none for fire wood. Chestnut and rock oak f. o. b. cars yield \$2.50 to \$3.50 per cord. With the price maintained at \$3.50 per cord, a small profit could be made. Otherwise little or none. The transfer of material at Newport from narrow to standard gauge makes operations almost prohibitive because of cost.

Insects and Fungi.

The most serious trouble affecting the trees in this forest is the chestnut bark disease, which has attacked our chestnut stand with great vigor. The disease has spread rapidly throughout the forest. Crews were kept going throughout 1912 locating the infected areas, marking the trees, cutting down, and destroying them. Thus far the crews have been able to cover an area of 2,555 acres, in which they discovered and destroyed 3,744 cases of infection. The expense of this work is great because the trees are widely scattered and considerable time is occupied in locating them. It is proposed to keep up the work and strike down this disease wherever it shows itself; but whether it will be possible to save the chestnuts is a problem. If the market conditions were better a considerable quantity of material could be sold; but as it is, only the very best stuff, railroad ties, telephone and telegraph poles can be disposed of.

On the areas upon which it was exterminated during 1912, 300 stumps have been re-examined and the blight has not reappeared. They are sprouting vigorously. On a few of the treated stumps the blight was found in a saprophytic condition. The increase during the year has been slow and not to compare with that in 1912.

A fungus disease, *Sphaeropsis*, is present affecting the white pine. It forms cankers on the roots near the ground surface. The only treatment applied thus far is removal and burning. Only 36 trees thus infected have been discovered, ranging in height from 9 to 37½ inches.

Forest Fires.

During 1912 there were 2 fires within the State Forest, both occurring in the month of December. The first covered 100 acres of State land and the second 1¼ acres. The upper surface of the forest floor was destroyed, but occasionally there were deeper burns in the humus. The damage is not great except to the youngest growth, where it was found the sprouts were killed in the larger fire.

Two fires occurred during July and August, 1912, both of which were located and extinguished by Fire Warden Hassinger of Upper Mifflin township, Cumberland county, and for which he deserves much credit for promptness. An observatory station 33 feet high was built on the Elder range. Work was done by the forester and the rangers. Two trees were used for the purpose.

Outing and Recreation.

There are numerous places within this forest where good camping places are to be found. The number of camps usually is small because

the hunters and fishermen prefer to board with farmers near the land and erect no camps. But 3 permits were issued during 1912 for sites within the State land. The game which is prevalent, consists of wild turkeys, pheasant, squirrel, rabbit, and raccoon.

A game preserve was established in 1912 and stocked with 30 deer, 6 males and 24 females. In appreciation of this work and at the request of those in interest, no hunting of deer was done in this region during the fall of 1912. The increase in this game has been noticeable, as marks of deer are seen in almost all parts of the forest, and occasionally the animals themselves are noticed quietly grazing in different localities.

The deer are now overspreading the forest from the nearby game preserve. Thus far four have been killed during the open season. All roads and trails are to be marked with signs and distances.

The three principal streams within the State land are Laurel run, Houston run, and Sherman run, and these were stocked with trout in 1911 and 1912.

The land in Cumberland county affords no good sites, all the camping places being located in Perry county.

All camp sites in this forest will be numbered from 3401 to 3499 inclusive, one of which has been leased under the act of 1913.

Lightning Report.

The number of trees struck and shattered during 1912 is as follows:

	April.	May.	June.	July.	August.	Total.
Chestnut,	7	3	4	5	.....	19
Locust,	1	.....	.....	.....	4
Rock oak,	1	.....	.....	1
Hemlock,	1	.....	1
Black oak,	1	1
Total,	26

Trees Struck and Ignited.

An American elm was struck and ignited by the current in April. The tree was partly dead and fire started apparently in the decayed portion.

During 1913, 70 strokes of lightning are reported, occurring as follows:

April,	1
May,	3
June,	10
July,	35
August,	19
September,	2
	<hr/>
	70

The trees struck and shattered were as follows:

Chestnut,	38
Black oak,	6
Red oak,	4
Scarlet oak,	2
Locust,	3
Hemlock,	3
White oak,	2
Rock oak,	9
Black birch,	1
Yellow pine,	2
	<hr/>
	70

24. THE ROTHROCK FOREST.

Forester, Alfred W. Bodine, Newton Hamilton.

Forest Rangers:

Thomas J. Temple, Newton Hamilton.

Herman A. Oppel, Wistie.

Eli Stayrook,* Mattawana.

Sam T. Woodside,† Black Log.

William H. Moist,‡ Ryde.

The Rothrock State Forest is located in Huntingdon, Juniata, and Mifflin counties, and is divided naturally into three parts, the Black Log, East Licking Creek, and West Licking Creek valleys. These divisions are such that they are used in forming the working plans of the forest and will later on be divided into compartments.

*Left service July 31, 1912.

†Appointed April 13, 1912.

‡Died June 20, 1913.

The boundary survey is not yet complete, but the completed portion has been posted and more than two-thirds of it painted. $3\frac{1}{2}$ miles of boundary line were brushed and cleaned out during 1912 to a width of 16 feet. It is planned to brush out the remainder to a width of only 4 feet.

The present area of this forest is 19,527 acres, 57 perches. A valuable purchase of the Gifford lands was made in 1912.

Scattered virgin timber is found over the entire forest, nearly all hypermature and ready for market. There are probably 3 million feet, including chestnut, oak, poplar, gum, birch, maple, hickory, yellow pine, pitch pine, white pine, and hemlock. Markets are good. Almost anything can be sold. With careful lumbering the forest will regenerate itself, but would produce uneven aged stands. The stand throughout the forest, except in a few places, will average over 50 per cent. The non productive area includes farm land 100 acres, rocks 500 acres, streams 22 acres, roads and trails 72 acres, boundary line 7.88 acres.

With the selection system of cutting, this forest will almost fully regenerate itself. The present stand will average almost 50 per cent. and with protection is gradually filling up. A pressing need is improvement cutting to take out undesirable species and give additional growing space for the remaining good trees. From this we may expect a yield of from 2 to 4 cords per acre over nearly the whole area. Only a small portion of the growth has a density of 10 per cent. or less. These are in rocky places where planting is not feasible and the present growth is sparse.

Springs and Streams.

All springs near roads, trails, or open boundary lines have been cleaned and made accessible. They are now usable in case of fire. There are no data at hand respecting the flow, but most of them are regular. This is attributed to a good ground cover of humus which is found over the entire area. For the same reason stream flow is regular and is little affected by heavy rains. Others in the adjoining open territory rise rapidly after a rain and become very low during dry weather. No contamination.

Buildings and Repairs.

Two houses in West Licking Creek need repairs. The dwelling house on the Oppel farm needs extensive repairs. All buildings need paint. Fences about the farm need rebuilding. A new stable was built at the Rothrock camp 12 x 16 feet. The trunk line of the

American Telegraph and Telephone line crosses this forest, but serves no local subscribers. The local Bell, Ferguson Valley, Orbisonia, and Patterson companies are nearby. Service is good, charge being \$1.00 per month except the Bell, which is \$26.00 per year. 200 telephone poles were cut and skidded during the season for such use as may be needed. A storage reservoir was built at the Aughwich spring to furnish water to the forester's house when built.

Roads.

Owing to the need for economy in road work in 1912, not so much was accomplished as during the previous year. The number of miles of roads brushed out for the first time was 9.98 and those rebrushed or improved have a total length of $7\frac{1}{2}$ miles.

In 1913, work continued from March to October, and nearly all the leading roads in the forest were repaired and brushed out. A portion of the West Licking Creek road was rebuilt.

The total number of miles of open road at present within this forest capable of being traveled is 45 miles, with 3.11 miles of trails and 3.43 miles of boundary lines.

Easements.

The easements existing upon the State land comprised within this forest are the lines of the American Telephone and Telegraph company and the right of way of the railroad of the Vincent Lumber Company. The right of way of the American Telephone and Telegraph Company would make a good fire lane if the company kept the area clean, but at present it is permitted to be grown up with dense underbrush, making it almost impossible to follow. The Vincent Lumber Company is troublesome because of the frequent fires they set.

Seed Collection.

The collection of a pint of seed from as many of the different species of trees and shrubs within this region as could be made, was taken during the summer and fall at such times when other work was not pressing. This seed was sent to the Department to assist in making up its specimen collection. For the use in the nursery, 13 bushels of walnuts were bought and 3 bushels gathered at the Oppel farm, in 1912.

Plantations.

During 1912, 35.37 acres were planted with seedling trees and $1\frac{1}{2}$ acres to willow cuttings. The following seedlings were planted:

White pine,	50,000
Norway spruce,	6,000
Scotch pine,	6,500
Basket willow cuttings,	5,000
	<hr/>
	67,500

In 1913, 65.05 acres were planted with seedlings. Total plantings during the year were as follows:

Norway spruce,	15,000
White pine,	117,000
Black walnut,	4,325
Honey locust,	1,150
Black cherry,	2,000
White ash,	1,000
	<hr/>
	140,475

To date 112.53 acres have thus been planted. 1.5 acres set with willow cuttings. To date the total plantings are as follows:

White pine,	184,000
Norway spruce,	21,000
Scotch pine,	6,500
Black walnut,	4,325
Honey locust,	1,150
Black cherry,	2,000
White ash,	1,000
Basket willow cuttings,	5,000
	<hr/>
Total,	224,975

Nursery.

A small nursery was established the latter part of 1911 at the Oppel farm to furnish walnut seedlings for planting throughout this forest. Its area is about one-fourth of an acre and 17 bushels of black walnuts were planted in 1911. The growth from this planting was 2,325 seedling trees, which were removed, heeled in, and held in readiness for the 1913 planting. The percentage of germination of the seeds was low, consequently the cost of producing the seedlings was high. This nursery will be abandoned and a new one established near the forest headquarters.

Labor.

Good labor in this region now costs 17 cents per hour, which is about the average rate paid by the Pennsylvania Railroad and the Brick Works. Good teams are hard to get. The farm stock is not of the best quality and the rate is \$4.00 per day for team and driver, or \$3.00 for a team.

Improvement Cuttings.

The white pine grove on the Oppel farm in Black Log valley was subjected to an improvement cutting in 1912, the object being to improve the condition of the remaining trees. The tract is used by the people of this neighborhood as a picnic ground and the aesthetic value of this improvement is probably its greatest value. In 1913, the forestry students made a small cutting to get practice in the work.

Markets.

As stated above, market conditions in this region are good and there is a steady demand for material. The call is for lumber, rock oak bark, hemlock bark, and chestnut for tanning extract. Locust is used for pin wood and hickory for spokes and handles. For paper wood, pitch pine, maple, linden, and poplar are used. The forest is located near to the main line of the Pennsylvania Railroad and freight shipments may be had at reasonable rates. There is a promise that the markets will not only continue good but improve with the improvement of the forest stand.

The greatest need of this region is an acid factory to handle all species of wood. All improvement cuttings could thus be utilized and the timber that is now going to waste, retarding the growth of more valuable trees, could thus be saved by being converted into a valuable product at a very considerable return to the Department.

Erosion.

There is no eroding of the soil in this forest. The woods are well developed with a good forest floor and a thick covering of humus. Streams do not become muddy after heavy rains.

Insects and Fungi.

The chestnut bark disease was discovered along the Harshberger road in this tract in the fall of 1911. Continued scouting for the infected trees was carried on and the infections discovered were

destroyed. With the assistance of the agents of the Chestnut Blight Commission during 1912, continued search for diseased trees was made and infections discovered were destroyed to the number of 1,825. 1,021 of these were sprouts from 1 to 6 inches in diameter at a point 1 foot above the ground. 804 were marketable trees of a diameter of 6 inches and upward. The quantity of material derived from these trees was 88,710 board feet and the infection was found scattered over an area of 7,000 acres. The disease has made little spread during 1913. The area worked over by the Blight Commission in 1912 has remained extremely free and few cases have reappeared. All the stumps have sprouted vigorously.

Forest Fires.

For a period of over 8 years there has been no fire in this region which wrought any serious injury to the timber. During the spring and fall of 1912, 3 small fires occurred on State land along the line of the Vincent Lumber Company's right of way. A total area of about 10 acres was burned over. The fires were attacked by the employees of the lumber company and extinguished.

In 1913, one fire covered 100 acres in November. The woods were damp and the loss small. One fire tower was built during the year on the summit of Blue Ridge mountain, and commands a view of the entire forest. It is made of chestnut timbers bolted together, 52 feet high, built square like an oil derrick. Numerous fires have occurred on nearby private woodlands.

Trespass.

But one violation occurred during 1912, the cutting of 2½ cords of chestnut wood. This was adjusted in a satisfactory way by the person who did the cutting paying \$1.00 per cord stumpage.

Outing and Recreation.

Hunting and fishing are favorite sports within this forest. 25 camping permits were issued in 1912 to hunters and fishermen, and in every case these gentlemen behaved themselves well while on State land. 167 persons thus enjoyed outing privileges at little or no cost to themselves. So far as reported, 1 deer and 25 wild turkeys were taken on the State land during the season.

Eighteen permits were issued into the forest during 1913. Over 100 people availed themselves of the camping privilege. Game appears to be plentiful, but little was taken. Several bushels of corn were spread for feeding the turkeys during the severe winter and some salt for the deer. East and West Licking creeks are good trout

streams and have been heavily stocked both by the State and the United States government. This planting should make fishing better in the future than it has been in the past. Black Log Creek, 24 miles long, is a rather sluggish stream, too open for the successful planting of trout except for the first few miles of its course. Suckers and eels abound in all the streams and these are destructive to trout spawn and small trout. If our streams are to be kept well stocked with trout, it will be necessary to get rid of the eels and suckers. 35 cans of fingerlings were planted in West Licking Creek. 1912 stocking with fingerlings proves the value of this method as against the planting of fry. All camp sites within this forest will be numbered from 3501 to 3599 inclusive.

Educational Work.

During the winter the forester visited the schools in Wayne, Bratton, and Granville townships and gave talks on forestry. The boards of directors have become interested and have introduced a modified form of the study into the schools.

Four of the 1913 students were tried out in practical work and were given something to do in all the different kinds of operations carried on. Three of these students were subsequently admitted to the Academy.

Lightning Report.

During 1912, the following trees were struck and shattered:

	June.	July.	August.	Total.
Chestnut,	6	12	8	26
Oaks,	4	11	5	20
Yellow pine,		4	1	5
White pine,		1		1
Hickory,		1		1
Locust,		4		4
Total,				57

During the month of July a yellow pine was struck and ignited by the current. Two oak logs lying on the ground were struck and shattered. A rock was struck and broken into small pieces.

Trees struck and shattered in 1913 were 9. One was struck and ignited. The species were

Chestnut,	5
Red oak,	2
Black oak,	2
White pine,	1

By months as follows:

May,	3
June,	3
July,	1
August,	1
September,	2
	<hr/>
	10

25. THE SEVEN MOUNTAIN FOREST, BARREE DIVISION.

Forester, T. Roy Morton, Petersburg.

Forest Rangers:

G. C. Deter, Graysville.

S. H. Lightner, Cottage.

The Barree Division of the Seven Mountain Forest is in the north-western portion of Huntingdon county. It has been divided into two ranges for convenience of administration, to each of which a ranger is assigned, Mr. Lightner in the Diamond Valley and Mr. Deter in Spruce Creek.

The survey of the boundary line of this forest is complete and is well posted, blazed, and painted.

There is no virgin forest on this land. Mature trees are scattered here and there over a portion of it, white pine, yellow pine, red oak, chestnut, and rock oak sufficient to cut about 800,000 feet. The area of this forest at present is 18,923 acres, of which 17,600 acres are available for wood production, 100 acres for roads and trails, 15 acres covered by water, 1,200 acres by rocks, and 8 acres by fire lanes. An area of 12,200 acres has a density of from 50 per cent. to 100 per cent., 4,400 acres range in density from 10 per cent. to 50 per cent., and 1,000 acres are covered with brush, huckleberry bushes, and growth other than good young trees. An area of 4,000 acres having a density of 50 per cent. or over is in need of improvement cutting and would yield about 5 cords per acre, producing mine props, railroad ties, and extract wood, the species predominating being chestnut, rock oak, and scarlet oak. The area with a density of from 10 per cent. to 50 per cent. contains chestnut, the common species of oak, pine, birch, and maple. Much of it is of inferior quality, fire scarred,

and short-bodied. Much of this land will reforest itself naturally if fires can be kept away from it. The remaining open area must be planted.

Springs and Streams.

The important springs on the State land have been cleaned, named, posted, and made accessible. Their flow is continuous with the possible exception of one of them. During the summer of 1911 its water disappeared, although in former years it had a continuous flow. During the summer of 1911 the humus on the forest floor around this spring was burned off. There seems to be a direct connection between the loss of humus and the loss of water.

The streams are small with a flow that varies slightly although during continuous dry periods the water becomes low. The possibility of contamination is remote.

Buildings and Repairs.

The only buildings on this State land are 3 hunting cabins which were upon the ground before the State purchased it, and there is no present need of additional buildings. There is no telephone line at present although a line of the Juniata and Shavers Creek Company runs nearby. It connects with the Bell line at Huntingdon. The service is good and the rate is \$2.00 per month.

Roads.

During 1912, 3 miles of old roads were brushed out for the first time and 15 miles were recut and improved. $1\frac{1}{2}$ miles of fire lane have been constructed. To date the mileage open and capable of being traveled is 45 miles with 12 miles of fire lanes. Forty miles of roads are traversable with a vehicle.

Leases.

The only leases at present exercised within these lands are those of the Federal Refractories Company, which were given for the purpose of removing ganister rock from Short mountain and Tussey mountain, which rock is used in the manufacture of silica brick. The first lease was awarded in 1903 and the second in 1909, and further reports thereof will be found elsewhere herein. It has been found that the existence of these leases is beneficial to the State Forest and not detrimental. A result of the rock removal by this company is that the small soil accumulation forms a good seed bed. Natural regeneration occurs where before there was no tree growth. The black locust is coming in in great abundance.

Minerals.

In addition to the ganister rock removed under the leases above referred to, hematite iron ore and hard and soft fossil ore are all found within this forest. The ganister rock is present in very large quantities.

Plantations.

During 1912, $2\frac{1}{2}$ acres were planted with seedling trees, 6,400 Scotch pine being used for this purpose. In 1913, only 300 2-year transplants were planted.

The total planting to date within this forest is as follows:

White pine,	54,850
Scotch pine,	9,150
White oak,	2,000
White ash,	3,000
Black walnut,	3,000
Balsam fir,	700
Norway spruce,	2,000
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Total,	74,700

The total area thus far occupied by the planting of seedling trees is 25 acres, and an additional acre has been planted with seed.

Labor.

Labor in this region cost 15 cents per hour in 1912. Now the price is $17\frac{1}{2}$ cents. A team is worth 40 cents per hour, including driver. The price of labor fluctuates by reason of local conditions. Good labor available for work on State land is scarce because of the impossibility of regular employment.

Markets.

The principal market near the State Forests calls for fire wood. Oak and chestnut are used at the extract plant at Mt. Union, 20 miles distant. The demand for mine timbers is fair. Fire killed chestnut is being used for the purpose.

Erosion.

Because of the well covered conditions of this land and the general good state of the forest floor humus, little or no erosion occurs anywhere on State land.

Insects and Fungi.

The white pine weevil is present sparingly in the plantation in Diamond Valley. Wherever its work is seen the attacked stem is cut out in the hope of destroying the weevil in any of its forms. Another insect, not known, is cutting the needles of the Scotch pine. Leaf rollers were abundant on oaks and chestnuts during spring and early summer. They seemed to prefer the chestnut. Some scarlet oaks are dying, probably from fungous attack.

Forest Fires.

There were no fires in this forest during 1912. But one small fire occurred in 1913, burning 75 acres upon State land and 5 acres on private land. It is supposed to have been started by children gathering flowers in the woods. An observatory station was erected on Tussey mountain along the Pennsylvania Furnace road. The whole of the Diamond Valley range may be seen from this point. It includes all lands south of the summit of Tussey mountain.

Outing and Recreation.

During 1912, 19 permits containing the names of 147 persons, were issued for camp sites in this forest. All were present during the open hunting season in the fall except one, which was encamped for the purpose of trout fishing. The conduct of the campers was good and no violations of the law or rules occurred.

The game taken includes 31 deer on the State land and 4 in the vicinity, 7 more than the previous season. All the hunters report deer abundant. 2 does were reported killed during the season, one on State land and one on private land. No evidence is at hand as to who did the killing. The running of deer by dogs is too prevalent in this region and a number of dogs have been killed while in the act of running deer.

Wild turkeys were abundant but not many were taken in 1912. Smaller game was found sparingly.

In 1913, 24 camps with 186 members enjoyed camping privileges within the forest, principally during the open deer season. Too much liquor is reported being present in four of the camps. 37 deer were killed within the State Forest during the season. Some does were reported shot. Game of all kinds was abundant.

Fishing within the streams upon the State land is not good. All camps within this forest will be numbered consecutively from 101 to 199 inclusive.

Lightning Report.

It was not possible to determine just when all the trees shattered by lightning were struck, but an examination of the woods discloses a total of 24 trees so injured during 1912, and distributed among the following species:

Chestnut,	7
White pine,	5
Jack pine,	4
Rock oak,	3
Scarlet oak,	2
White oak,	1
Hickory,	1
Locust,	1
	<hr/>
	24

In 1913, 37 cases of trees being struck and shattered by lightning were noticed. No accurate data as to actual occurrence were taken. The species struck were as follows:

White pine,	11
Chestnut,	9
Red oak,	3
Yellow pine,	2
Rock oak,	7
Hemlock,	2
Locust,	1
Scarlet oak,	2
	<hr/>
	37

So far as known, no trees were ignited by any of the bolts.

26. THE SEVEN MOUNTAIN FOREST, BEAR MEADOWS DIVISION.

Forester, Walter D. Ludwig, Boalsburg.

Forest Rangers:

W. H. Harpster, Charter Oak.

Robert Reitz, Boalsburg.

The Bear Meadows Division of the Seven Mountain Forest consists of about 21,000 acres, of which 14,000 are in Huntingdon and 7,000 in Centre county. No fixed subdivisions have yet been arranged because the divisions of this forest are not yet definitely established.

The boundary survey is complete. All corners are rebuilt, marked, and lines brushed, painted, and posted, with the exception of a single warrant.

The forester is conducting a topographic and stock survey, beginning with the establishment of bench marks.

Virgin forest on the division comprises about 1,600 acres, 1,000 acres in the Pine Swamp, 200 on Tussey mountain, and 400 on Greenlee mountain. The Pine Swamp area will run 5,000 feet to the acre. Some trees will cut as much as 1,000 feet. A number of trees are in good condition and there is no present market for them. The two smaller areas contain much dead and dying pine, but the market conditions make it inadvisable to attempt to remove it. 300 acres of the Kepler tract would be available for the market if there were any. Should the chestnut bark disease make its appearance a general cutting of this whole tract would be advisable. All the above tracts have a density in excess of 50 per cent. The greater part of the division ranges in density from 10 per cent. to 50 per cent. Most of the area is regenerating from coppice not of normal density, but sufficient to insure a soil cover. Some strengthening by planting must take place in the future. General reforestation by planting is not justified because of cost, except in old fields and open grounds.

The forester was engaged at different times during the year in educational and cooperative work. Magazine and newspaper articles were prepared, approved, and published. Advice on practical problems was given to those who desired it. He assisted in the instruction of the agents of the Chestnut Blight Commission during a portion of the time they spent at State College. He also assisted in nearby woodlot work.

From July to the middle of October, the forester was engaged in the collection of statistics in cooperation with the United States Forest Service to be used for the preparation of a bulletin on Pennsylvania's Wood-Using Industries. He collected statistics for Elk, Cameron, McKean, Warren, Jefferson, Forest, Venango, Clarion, Lawrence, Butler, Armstrong, Beaver, Washington, Greene, Franklin, Fulton, and assisted in the collection of data for Allegheny county and the city of Pittsburgh. During a portion of the month of December he was present at the office of the Bureau of Products in the Forest Service at Washington assisting in the compilation of the data.

Springs and Streams.

Nearly all of the springs have been cleaned, made accessible, posted, and named. The flow is regular with no possibility of contamination. Good humus conditions and the absence of fire for some years are responsible for this condition of the springs.

Buildings and Repairs.

Repairs at the house occupied by Ranger Harpster are complete and the property is in good condition. They included the addition of a porch on two sides of the house, wood house, new entrance to the cellar, roofing, spouting, painting, and other small items. The forester has been able to fit up for himself an office in Boalsburg through the courtesy of Mr. Theodore D. Boal. There are no telephone lines on the division.

Roads.

During 1912, 33.8 miles of old roads were rebrushed and improved, 10.2 miles of trails and fire lanes, and 6 miles of boundary line were rebrushed.

In 1913, 42.4 miles of old roads, trails, and fire lines were brushed and improved. $2\frac{1}{4}$ miles of the Shingletown road were repaired and an additional mile along Pine Swamp road. Other roads received such repairs as opening ditches and culverts, removing dead trees, bowlders, loose stones, and improvement of the grades.

Minerals.

There seems to be no surface indication of valuable minerals, with the exception of ganister rock, which is present in large quantities on the ridges. The distance from marketing and manufacturing points has not yet brought this into use.

Seed Collection.

Two pounds of white pine seed were collected and sowed broadcast in the woods. Few seed-bearing trees are present and seed collection is not likely to become large.

Plantations.

During 1912, 5 pounds of white pine, 1 pound of Scotch pine, and $\frac{1}{2}$ pound of Douglas fir were used in making experimental plantations. Some of the seed was sown on the snow and the other on the bare ground. To date the result has shown little or no difference between the two methods. The plantation work during the year included the following species:

Red oak,	20,000
Scotch pine,	11,400
White pine,	204,600
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Total,	236,000

Of the above planting, 21,000 were used in reinforcing old plantations. All plantings are 4 x 4 and all are doing well except the red oak planted in 1911. Many of these trees were cut off by rabbits. The fall planting of broad leaf trees seems to be objectionable in this region on that account. Some pines planted among briars were smothered out. Generally they are doing well. The under-planting of scrub oak areas with red oak is giving favorable results to date.

During 1913, 104,000, seedlings were planted, as follows:

White pine, 2-year,	80,000
White pine, 3-year,	23,000
Scotch pine, 2-year,	1,000
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	104,000

All seedlings are spaced 4 x 4 feet.

Experiments in planting among scrub oak made in 1912 appear to be successful. In an experimental plantation of alternate rows of Scotch pine and white pine made in 1909, it is found that the Scotch pine is growing twice as rapidly as the white pine, and is more thrifty.

300 acres of this division have thus far been planted to trees and all available open areas are thus used. Reinforcing of old plantations will be required from time to time.

The total plantation work to date is as follows:

Scotch pine, 2-year,	9,840
Scotch pine, 3-year,	4,560
White pine, 2-year,	736,060
White pine, 3-year,	104,840
Honey locust, 1-year,	500
Red oak, 1-year,	30,000
White ash, 1-year,	500
American elm, 1-year,	500
Willow cuttings,	2,000
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Total,	888,800

The honey locust was a failure and some of the early plantings of Scotch and white pine show about 60 per cent. growth owing to unusual drought which followed the planting. The willow planting of 2,000 cuttings which was entirely experimental, shows a growth of 30 per cent., and 10,000 of the early red oaks, which were likewise experimental, show a growth of about 40 per cent. The remainder of the trees are doing well.

Labor.

Labor conditions are satisfactory. The average price paid was 15 cents per hour in 1912 and from 10 cents to 15 cents an hour for teams. In 1913, labor advanced to 17 cents per hour and two-horse teams to 35 cents per hour. Huntingdon county conditions are better than those in Centre. The farm land of the region is poor and the people occupying it are looking for employment in forestry work.

Markets.

There is at present no good market for forest material. There are no nearby wood-using industries and railroad rates are high. Fire wood is in small demand in the neighborhood. Every farmer has his own woodlot. When improvement cuttings are ripe, it is hoped that market conditions will have changed. A large amount of material must necessarily be removed in the course of improvement cuttings within a few years. There is nothing in the region to use forest products and local needs are supplied by local private effort.

Insects and Fungi.

The chestnut bark disease is present in this forest. Eradication was immediately undertaken as soon as it was discovered. All State land

has been scouted and the infected trees located so far as possible. The destruction of the infection is now proceeding. In all 762 infections were discovered in 1912. The attack is confined to Jackson township, Huntingdon county. In 1913, 85 infections were found and destroyed.

Forest Fires.

There were no forest fires in this forest during the year 1912. Two fires occurred during 1913, one of which covered about two acres in Huntingdon county, with little damage resulting. The other, during the latter part of April, at the time of high winds, covered 1,500 acres. The damage was more severe, killing about 35 per cent. of the growth and destroying 50 per cent. of the humus. The loss will reach at least \$3,000. The cause is supposed to be the camp fire of a crowd of small boys who left the fire burning. No proof of this fact, however, exists.

One fire observatory station has been erected on Bald Knob. Another is to be built on Greenlee mountain. The fire wardens are efficient and their work is satisfactory.

Outing and Recreation.

No reported violations of the forest, fish, and game laws have been made. 14 permits were issued in 1912 to 90 persons for camping sites in this region. The conduct of the campers was all that could be desired. So far as reported, 20 deer were killed during the open season, many pheasants, rabbits, and smaller game.

15 permits were issued for 82 persons to camp within the division in 1913. 6 over-night permits were granted by the forester to 12 persons. 20 deer, many pheasants, rabbits, and small game were taken.

The fishing seasons were good and hundreds of brook trout were taken. It was noticed that some of the campers were careless in the disposition of their garbage. This will be prohibited in the future and all refuse must be carefully removed and buried out of sight. All campers were warned about contamination of streams and are careful in this respect.

Camp sites in this division will be numbered from 1 to 99 inclusive.

The forester has been engaged, when it was possible to give attention to this branch of the work, in assisting with Arbor Day exercises in the public schools, making addresses to the school children, and giving them instruction in the planting and care of trees. Also at other times in assisting where aid might be rendered, teaching children respect for the work of the State.

Lightning Report.

During 1912, the following trees were struck and shattered:

	May.	June.	July.	Total.
Chestnut,	1	.....	.....	1
White pine,	1	.....	1
Pitch pine,	1	1	2
White ash,	1	1
Total,	5

So far as observed, no trees were ignited by the lightning strokes.
But a single stroke of lightning is reported during 1913, and that in a pitch pine during the month of May. The tree was shattered but not ignited.

27. THE SEVEN MOUNTAIN FOREST, POE DIVISION.

Forester, Charles R. Meek,¹ Spring Mills.

Forester, W. E. Montgomery,² Spring Mills.

Forest Ranger, W. F. McKinney, Spring Mills, R. D. No. 3.

The Poe Division of the Seven Mountain Forest was formerly a part of the Coburn Division and lies in the region near Potters Mills, Centre county. It extends from the Millheim pike westward to the Bear Meadows Division, in Harris, Potter, and Gregg townships. It includes State land in Centre county as far north as Penns Valley, and is of about 14,000 acres in extent. The management thus far has been as a unit and no subdivisions have been made. The boundary lines have been surveyed but some of the marks have disappeared. The boundary has been generally painted and posted. There is present no virgin forest. Many old pines are scattered about over the area. Some are dead, others dying. All are deteriorating. A quantity of rock oak is present which will not improve. The cutting of these old trees will yield several hundred thousand feet and should be undertaken as early as possible. From 2,500 to 3,000 acres are covered with brush. Some of this will be reforested naturally by better species. It must be assisted, however, with artificial planting. Several experimental plots are about to be undertaken to determine the best methods of handling the brush area. The open ground on the division will not amount to more than 40 acres, exclusive of camp sites. A good growth of young hardwoods, principally oak and chestnut, is found over the balance of the division.

That portion of the land which was not burned in May, 1911, is covered with young fully stocked material. Where the fires ran that year recovery has not yet been complete. Scrub oak and huckleberry prevail over the burned area. Fire killed wood at various places is being disposed of to an advantage. The people of the neighborhood use it for fuel.

Planting at present is too expensive to be undertaken over the whole of the burned area. It will be wiser to wait until natural regeneration restocks it.

¹ Transferred to Coburn Division September 1, 1913.

² Began service September 1, 1913.

Springs and Streams.

Springs are numerous and paths have been opened to them from nearby roads. At least 25 of them never fail. Some have been cleaned and walled. All the best springs are posted. No contamination is present. They will be improved from time to time and made more accessible.

Buildings and Repairs.

The ranger's property on the Bellefonte Pike is not in good condition and is scarcely worth repairing. The barn is in good condition but needs paint. A new house is a necessity at this place. Water may be supplied for the buildings by gravity. A small building is located at Stone Creek gap, used by the workmen when engaged in that region.

The Commercial Telephone Company's line passes the ranger's house.

Roads.

Forester Meek was assigned to this division only in September, 1912, since which time he has brushed out and improved 12 miles of road. During the early part of the year while in charge of Forester Seltzer, 10½ miles of road were brushed and repaired.

The roads and fire lanes of this division equal at least 45 miles. Most of them can be used for transportation. Not all of this mileage is in the best condition, but is being improved gradually.

Plantations.

No planting was done during 1912. In 1913 25,000 2-year white pine were planted in two plantations.

To date 29 acres have been planted in which the following seedlings were used:

White pine,	71,700
Sugar maple,	2,500
	<hr/>
	74,200

Nursery.

In the spring of 1912, Forester Seltzer started a nursery at the place where the ranger lives, covering one-eighth of an acre. The 1912 inventory is as follows:

White pine,	2,000
Scotch pine,	4,500
Douglas fir,	2,500
Red pine,	2,500
Norway spruce,	12,800
	<hr/>
	24,300

The amount of seed from which the above stock was grown, was $7\frac{3}{4}$ pounds, as follows:

White pine,	$2\frac{3}{4}$ pounds
Scotch pine,	1 pound
Douglas fir,	$\frac{1}{2}$ pound
Red pine,	$\frac{3}{4}$ pound
Norway spruce,	$2\frac{3}{4}$ pounds
	<hr/>
	$7\frac{3}{4}$ pounds

The damping-off fungus killed a number of the seedlings, and this, in connection with the poor germination of the seed, accounts for the rather small size of the stock, which, however, is in good condition.

The nursery was enlarged in 1913, to contain about 6,400 square feet. The seedlings contained at the end of the growing season 1913, are as follows:

Scotch pine,	4,800
Red pine,	3,300
White pine,	1,500
Douglas fir,	3,400
Norway spruce,	12,000
European larch,	6,000
	<hr/>
	31,000

Labor.

Labor in this region in 1912 cost 15 cents per hour; in 1913, 16 cents per hour. Occasionally it rises to $16\frac{1}{2}$ cents. There is a reasonable amount of competition but usually sufficient labor may be had. Teams cost 40 cents per hour with driver. Carts with driver \$2.50 per day. The labor which is to be had here is of good quality.

Markets.

The local market is well supplied with sawed material, there being a number of small mills in the neighborhood. A large part of

the product of these mills is sold beyond the local market. White pine timber is worth \$20.00 per thousand feet at the mill. Dead wood is in fair demand for fuel purposes. A 2-horse wagon load when removed by the purchaser, sells for 25 cents. All cutting is done under the supervision of the ranger, and no green wood is permitted to be taken. All nearby transportation is by team. The railroad is 6 miles distant. Those living near State land take quantities of this material. By these means nearly all the objectionable material has been removed.

Insects and Fungi.

The chestnut bark disease has appeared in this forest. In 1912, 24 infections were discovered and burned. The woods will be carefully watched for any reappearance, and whenever found the disease will be destroyed.

Forest Fires.

There were no fires in this forest during the year 1912. A single observatory station has been erected in a tree on private land.

In the fall of 1913 there was but one forest fire along Stone Creek road. The damage resulting was small. Another observatory station was built on the division. A third is needed on Bald mountain. From a point on this mountain nearly the whole State Forest may be viewed.

Trespass.

During the hunting season 3 does were killed on State land. Reports of these violations were made to the Game Commission. No evidence could be discovered as to who did the killing.

Outing and Recreation.

Five camping permits were issued for this forest in 1912, although but 4 of the parties containing a total of 37 men actually located their camps within the State land. So far as known, none of the campers violated any of the laws or rules. In addition to the 3 does above reported, 23 lawful deer were killed, 100 pheasants, 300 rabbits, and 10 woodcock during the season.

10 camping parties had permits for this region and 8 were used by the applicants in 1913. A number of other parties were encamped on private land near the State Forest but hunted principally on State land. There were probably 150 deer hunters in the neighbor-

hood during every day of the open season. 18 deer and 1 bear were taken by these parties. One doe was killed. Pheasants, rabbits, and grey squirrels were abundant.

6 cans of trout were planted in Potters stream.

* Camping sites on this division will be numbered from 601 to 699 inclusive. Thus far 21 have been prepared, marked, and numbered.

28. THE SEVEN MOUNTAIN STATE FOREST, COBURN DIVISION.

Forester, John W. Seltzer, Coburn.

Forester, Charles R. Meek, Coburn.

Forest Ranger, David Libby, Weikert.

When Forester John W. Seltzer left the service, the Coburn and Poe divisions were joined under Forester Meek. On September 1st, 1913, Forester W. Erdmann Montgomery was assigned to the Poe division, while Mr. Meek remained in charge of the Coburn division.

This division is long and narrow, including the White mountain east of the county line at Cherry Run, and all the land owned by the State east of the road from Decker Valley to Poe Valley, thence to Millheim, to Zieglerville, to the Centre-Mifflin county line. County line and Penns Creek form the southern boundary, the top of Thick Mountain is the northern boundary, and the eastern boundary is a road one mile east of Weiker, crossing Paddy mountain to the head of Cherry Mountain. Penns Valley at the westerly side borders it on the north, and the Buffalo valley in the easterly side borders on the south.

The Coburn Division of the Seven Mountain Forest lies just back of the small town of Coburn, whence it gets its name. The western portion of the division lies in Centre county entirely, while the eastern portion lies in Centre and Union counties. Two things of importance should be mentioned here as they are of great value in determining the geology of the region. They are Penns Creek and the fact that the Pennsylvania Railroad traverses the area from Coburn to Weikert, the banks of the creek and the cuts of the railroad showing many formations that would otherwise be hidden by the covering of earth. The county line between Centre and Mifflin

counties forms the division boundary on the south in Centre county as far east as Paddy Mountain tunnel. From here Penns Creek forms the southern boundary as far east as the Union county line at Cherry Run. The Union-Centre county line at this place is inside and the division is in both Union and Centre counties.

In Centre county the division lies in Gregg, Penn, and Haines townships. In Union county it lies in Hartley township. It will thus be seen that the division is very long and narrow, comprised of a few valleys and mountains. The division is drained by tributaries of Penns Creek, which flows southeast into the Susquehanna River. Penns Creek at Coburn receives Pine Creek from the north and taking a southeasterly course it gaps the mountain, crosses the head of the little slate valley south of Beaver Dam tunnel, called by the Germans "Lechathal" or Lick Valley, and enters Haines township on the east.

Leaving the slate valley at Fowler's, on the L. & T. R. R., it again gaps the mountain of Oneida No. IV before crossing the eastern edge of the Poe Valley, finally leaving Centre county through a beautiful gorge in the Medina white sandstone of Paddy Mountain. The important streams entering it from the Coburn division are Licking Valley stream, Poe Creek, Cherry Run and Weiker Run. The railroad running along the creek furnishes a few levels as follows:

Lewisburg and Tyrone Railroad

	Dist. from P. & E. R. R. Junc.	Above Ocean Level.
Tunnel at Paddy Mt., ..	32½ miles	959 feet
Fowler's,	34 miles	991 feet
Beaver Dam Tunnel, ...	35 miles	1014 feet
Coburn,	36 miles	1026 feet
Buchanan,	41 miles	1059 feet

Topography.

The sand rocks of No. IV form all the double synclinal mountains in the southern portion of Centre county, such as Nittany mountain, Brush mountain, Tussey mountain, and the various local ridges included in the Seven Mountains. The ridges of the Seven Mountains are a series of synclinal canoe shaped hills, separated by anticlinal valleys of limestone and slate, but all presenting the same rocks in the same order. The short and minor anticlinals of Poe, Confer, and other small valleys within the Seven Mountains are but repetitions of these folds in the earth's crust, which have been only strong enough to bring to the surface the next higher or Hudson River slate formation No. III.

General Geological Structure.

The Confer or Decker Valley Anticlinal.

This short axis while showing the same general northern inclination or curvature at its center, is of meagre relative importance, only having been of sufficient force to bring up the Hudson River slate of No. III, in the Confer or Decker Valley in Gregg and Potter townships, and the same in the small oval "Lechathal" or Lick Valley watered by Penns Creek and Swift Run in the lower part of Haines.

Entering the county in southern Haines, south of the Little Clinton red shale valley of No. V, it ranges successively through the upper, middle and lower members of IV in the first $2\frac{1}{2}$ miles of its course, finally lifting up the slate in the small "Lechathal" Valley. Passing north of Fowler's station on the L. & T. R. R. this sharp arch throws off 69° dips south of Beaver Dam tunnel and dives thence under a vast sand flat of Oneida sandstone between the western extremity of this valley and the eastern end of Confer's valley 4 miles apart. Here the anticlinal again brings up the slate of No. III with dips of 60° - 70° at the M. E. Church, keeping the north side of that valley for $7\frac{1}{2}$ miles, when it again carries down the slate under the Oneida sandstones of the resulting kettle, finally passing out of the county in southern Harris between the white Medina ridges of Thick Head and Bald mountains.

The Poe Valley Anticlinal Axis.

This, the last of the anticlinal axes of the county, has a length of only about 15 miles before passing into the extremities of Union and Mifflin counties. Like its predecessor to the north, it brings up only the slates of No. III in Poe Valley, a drawn out oval shaped depression in the heart of the Seven Mountains 8 miles long from east to west. It is much straighter than the Confer Valley axis, and while it is a mile and a quarter south of it in Gregg township, its two extremities nearly lap with those of the northern axis. It is insignificant in its results, lying everywhere along the base of Paddy mountain, which it divides on the west from Bald mountain spur seen rising west of the Lewistown pike where the Mifflin county line is offset.

Centre County Township Geology.

Gregg Township.

In the Seven Mountains the southern portion of this township is beautifully diversified by the intrusions of small portions of the

Confer and Poe slate valley anticlinals into the wide sand flat of Oneida No. IV.

From its east head a wide sand plateau of No. IV Oneida extends to the Penn line, holding this anticlinal and the synclinal of Faust valley and spreading south into the Poe valley anticline. This slate valley heads westward from Penn township and is similarly encircled with No. IV Oneida ridges to Confer Valley. The synclinal of Faust Valley, between Poe and Confer, shoals eastward before reaching the Penn line, while to the south the Mifflin county line is marked by the high straight ridge of white Medina, known as Long or Paddy Mountain. This portion of Gregg is wild and very rocky.

Penn Township.

The Seven Mountains with their included slate valleys take up about one-half of the township. East of the Slide Mountain tunnel there is a fine exposure of No. IV gray Oneida, forming the north barrier to the little slate valley of the south. The rock rises in ledges 80' high and dips about N. 28° W. 48° . Oneida sandstone shows about 225' thick in the tunnel, mixed with some slate of yellow color and wavy structure. The little valley called "Lechathal" or Lick Valley by the German residents, is only about a half mile wide, and heads up west in this township into an elevated sand flat of No. IV Oneida, before mentioned in Gregg township.

On the road leading south from the saw mill on the Penns Creek road in George's Valley, near the Gregg line a section of the same rocks is exposed, showing first II, south of the track, overlaid with Hudson River slate of III, dipping S. E. 35° .

This is followed by Oneida south of the first dwelling, with the same dip, continuing to the bend of the road at the small stream crossing, which marks the beginning of the red member, with a south-east dip in the north leg of the synclinal of 20° . Half a mile south of G. Confer's, north dipping Oneida marks the south side of this red shale and sandstone valley, as well as the north barrier to the wide sand plateau, with an anticlinal and a synclinal, and forming the mountain ridge encircling the Poe Valley to the south. This is another slate anticlinal of III, and stretches across the township from east to west from S. Lenge's saw mill to Mussert and Gepheart's old mill.

Two rough roads enter it from the north at either end, and a wood road traverses the creek. The valley is about a half mile wide, and is a regular tight anticlinal of slate, supporting on its south leg the successive members of IV with the straight white Medina crest of Paddy mountain marking the Mifflin county line.

Haines Township.

This township is bounded on the south side by Paddy Mountain. Union county forms its eastern border line, with Penn township on the west. The only good sections of the Seven Mountains are by the road to Fowler's station and along the railroad.

The public road carries limestone on a south dip of 55° to a pond 50 yards south of the bend up into the mountain, meeting the slate of III at that point, and Oneida IV about half way up the flank. The latter extends to the crest at 550' above the creek, with dips of S. E. 54° , carrying some conglomerate of rounded gray quartz pebbles with a reddish tinge. The road descends south into a red shale valley of lower Medina. The synclinal of this valley is north of S. Stover's, for there the dips are to the northwest 50° - 58° . No. IV Oneida succeeds south at the stream crossing with the same characteristics and breached by a branch of Swift Run, though the supporting slates of III are seen dipping N. W. but soon arching over the anticlinal of this valley to dip S. E. along Swift Run. This is the "Lech-athal" or Lick Valley, 4 miles long through which the L. & T. R. R. runs, carrying slate as far as Fowler's station, and succeeded by IV Oneida.

The south barrier is a tightly compressed synclinal, between this valley and the eastern end of Poe valley anticlinal to the south, which barely crosses Penns Creek. Oneida sandstone encircles it and forms the southeast dipping terrace to Paddy Mountain, which latter makes the county line. The L. & T. R. R. makes a tunnel in this white Medina crest. Like the Beaver Dam hill to the north, this ridge is also pierced where it is only about 80' above the stream, which has made a wide detour westward before cutting through the hill where reinforced by Poe Creek. The synclinal is evidently just south of the tunnel, for 50' from the south face white Medina dips N. 8° , W. 54° , and S. 12° , E. 88° , in the tightly folded basin. It shows 25' of sandstone and 2' of slate in the north leg to the tunnel mouth. In the tunnel there is about 170' additional, and a hundred feet more of mixed red shale and sandstone brings us to the north end of the tunnel, where there is a dip of S. 30° , E. 75° . Red rock shows for 120' more to the end of the tunnel approach. About 200 yards north of the bridge over Penns Creek, red Medina presents an excellent exposure of red shale and sandstone probably 250' thick, dipping S. 28° , E. 60° , forming the south leg of the Poe Valley anticlinal.

Oneida sandstone comes in north at the new steam saw mill dipping on the east side of the creek S. 30° , E. 62° , conglomeritic. Near the 33rd mile post, slate shows a rather distorted anticlinal arch about 200 yards north, with dips of North 28° , W. 60° , and S. 30° ,

E. 60° , though curved and cross-bedded by cleavage planes, rendering dips indistinct, in black slate. The gap is an exceedingly beautiful one, and is still very wide and unbroken by cultivation.

Union County.

The foregoing refers chiefly to the part of the division that lies in Centre county. That portion of the division that lies in Hartley township in Union county, which includes the part that lies on the eastern part of Paddy Mountain and White Mountain, is now to be considered.

The White Mountain anticlinal is of only slight importance in Union county, extending for about 4 miles east of the Mifflin county line, but subsiding so rapidly eastward that the red and white Medina No. IV, the lower Clinton and Ore sandstone are all carried under water level on the railroad east of Weiker station.

Paddy Mountain anticlinal, a double flat roll of Bloomsburg red shale, where first seen south of Cowan, elevates the Medina sandstone in the Paddy Mountain spur in Hartley. Union county contains only a very small amount of Marcellus formation, caught in the Buffalo Valley synclinal north of Lewisburg, where perhaps the whole of the Marcellus formation exists, but little if any of the overlying Hamilton. The Marcellus black slate has been a very fruitful source of disaster to several coal mining companies in the district, which have labored long to find coal in them. Every effort has proved a failure, as well as in the Hudson River and Utica slate formations of III. The rocks of formation VI outcrop through Gregg township, where the beds are thin, and are nowhere opened over 50' in thickness.

Entering Hartley township the outcrop of Ore Sandstone is somewhat obscure in places; but seems to be displayed in a long gently curving ridge extending for about 9 miles west in the main Buffalo Valley synclinal to within about three miles of the Mifflin county line. Here it basins and returns to within about 2 miles, apparently crossing the railroad at Weiker east of the station, and after lapping over the White mountain anticlinal makes a synclinal loop between that axis and Jacks Mountain and then returns on a north dip along the flank of the latter for 10 miles to Penns Creek on the Limestone township line.

James Pursley has opened several ore-pits south of the Heranimus Church in the field east of his house and just north of Penns Creek. Conditions indicate the presence of two distinct beds of ore, probably 250' geologically apart and separated by brownish yellow shales holding a bed of sandstone several feet thick, and possibly representative

in this field of the Iron sandstone. Mr. Pursley said the ore was fair. A short distance east where the ridge is cut off in a bluff facing Penns Creek at Weiker station, the first or most northern outcrop is opened 12" thick on a dip of 50° N. W. The sandstone bed before mentioned lies to the south of this opening, thin, but making a distinct ridge north of White mountain. About 10 yards south and back of this sandstone bed the lower ore bed is opened about 20' above water level. The railroad cut, just south of this opening, shows an excellent exposure of sandstone and shale 60" thick on a dip of N. 20° , red on the bottom and gray on top.

Zimmerman's old mine (now owned by D. C. Johnson) is situated about $1\frac{1}{2}$ miles below Cherry Run, and is opened on the south side of the railroad on a steep N. W. pitch and a short distance from Kaylor station. The Zimmerman ore is about at the western end of this central valley Clinton ridge. Westward this ridge is entirely eroded, and any profitable ore in this vicinity must be sought for along the flank of Paddy mountain, where the debris of the Medina sandstone makes its out-crop hard to locate.

The lower ore bed series is also said to show an out-crop for some distance up Weiker Run, south of White mountain but not opened there. The Clinton ore measures extend west a short distance into Mifflin county making a low ridge as far west as Aumiller's place, but only containing the lower ore bed. Just west of Cherry Run station the railroad cuts through red and brown shale, dipping 70° N. W., and at the west end of this cut, test pits, which had only partial success had been put down for ore. Just below the bridge on Cherry Run the Clinton shales are well exposed. Going up Cherry Run, the dip is steeply N. W. at first, but soon reversed in a tight synclinal, marking the extension of the Hartleton basin. The first ore drift is about 100 yards north of the railroad, driven N. 50' to the ore and then E. and W. on the bed. Nearly a thousand tons are said to have been mined at this point and shipped to the Berlin Iron Works, Bloomsburg, and Danville. The bed when first struck, as reported by Mr. Johnson, was 2' thick; but pinched eastward to from 10"-12", and is said to have furnished a 45% ore.

The Birds Eye Fossil ore was once opened well up on the flank of Paddy Mountain on the west side of Cherry Run, where it was found only 10"-12" thick. The old Johnson bank, situated about $\frac{1}{2}$ mile east along the flank of the mountain, is no doubt on the same ore bed although as far as mining was carried on here the entire yield of the bed was an altered brown hematite. Mr. Johnson reports having opened the same hematite ore farther east and immediately north of Kaylor station.

The old Berlin Iron Works, which was the principal consumer of all the ores mined in this section of the country, have long been dis-

mantled. The furnace stood on the south bank of Penns Creek, about $1\frac{1}{2}$ miles south of Laurelton, and was a Charcoal plant erected in 1818, since which time it has been operated by different parties. The failure was due to their lack of sufficient power, and their failure to recognize the fact that their ores were cold-short, and were consequently unfitted for forge irons. Consequently for the past 35 years one of the best equipped small furnaces has remained idle, largely from a lack of suitable local ores, which alone could have justified its location.

There is no gold, silver, copper, lead, zinc, bismuth, antimony, or tin in the whole county in workable veins, less than many thousands of feet beneath the surface. The mountains of the district are barren of all precious metals; the people should not throw away their money in mining for them. Small deceptive exhibitions of lead and zinc ores may be expected to present themselves at perhaps more than one point, but every dollar spent in trying to open a lead or zinc mine will be money thrown away. The abundance of Iron Pyrites or "Fools Gold" in the Marcellus shales has deceived many persons, and will deceive many more in the belief that it is gold; whereas it is only a crystallized compound of iron and sulphur, and of no value except in the manufacture of vitriol, and then only when it can be mined in large masses cheaply.

No boring for either an oil or gas well will ever be productive in any part of this district. The Venango and Bradford oil formations crop out in belts across the district, but they hold neither oil nor gas. The Trenton rocks of Ohio and Indiana underlie the district but there is no shadow of probability that they hold either oil or gas. Whatever oil or gas may have existed in these formations originally, has long ago been evaporated from them; so folded was this part of the earth's crust and so cracked at the rise of the continent at the end of the coal age.

The search for coal will be equally vain. Expectant people have dug into certain black slates in hope of finding a coal bed; in hope that the black slate found at the surface will turn to coal. Such hopes are foolish. There are also black slate beds in the Marcellus and in the Genesee formation; and sometimes these black slates have a good bit of old animal fat in them, which time has changed and hardened into asphalt, so that specimens put into a blacksmith's fire will fry and flame for a few minutes. But no one has ever seen or heard of a coal bed in these formations. There is not a ton of real coal in the whole county. All the formations in the district are much older than the coal measures and were deposited before the first coal bed was made. The oldest coal bed is that in Perry county and that is good for nothing.

General.

All of the Coburn division of the Seven Mountain State Forest Reserve is rough country; the mountains high and rocky, the valleys deep and narrow. Originally the country afforded a dense growth of the best timber the market could demand. This is now all gone except a few patches almost inaccessible, standing like tombstones of their fallen companions. They are gnarled, these old veterans, fire scarred and limby, but one can now and then get a glimpse of what they must have looked like before subdued by the hand of civilization. The reserve lies in the heart of the picturesque Seven Mountains. Penns Creek winds its way along through the mountains in a most beautiful gorge. It makes two magnificent loops around the points of the mountain, doubling back within a short distance of itself. It lies in the lowest part of the county, dropping 15' to the mile. The small mountain valleys lie high above its rippled surface and afford a few fair mountain farms. The woods are wild and furnish excellent fishing and hunting, which is fully appreciated by the people from the surrounding country.

Here is a variety of conditions of country presented to the eye. We have the well watered and well drained valleys as Poe, High, and Rupp Valleys; swamp land as is seen in Pine swamp; sand flats as along the Millheim and Zieglerville Pike; plateaus as Old Mingle and Little Flat; the beautiful sheltered Lick Hollow or "Lechathal" as commonly called; the high, rough, and rocky Paddy and the steep White Mountain and quite in contrast the sandy contours of Big Poe Mountain; there are numerous kettles, some small and some large; among the most famous are Auman Kettle, Grape or "Traube Kessel" as called by the German farmers, and the pleasant Cherry Run Kettle. The streams abound in fish, the woods in deer and bear and over all, especially east of the railroad is coming on a grand cover of fine young timber. West of the railroad the country is not so well covered, having been severely and repeatedly burned over. Here the Department of Forestry is planting hundreds of acres in an effort to reforest the denuded ground.

The P. R. R. winds its way through these mountains along the fortunate gorge of Penns Creek, piercing the mountains in two places. The valleys were not so steep or the mountains so rough that the lumber companies that operated in them could not build their tram roads to take out the timber. However, since they have been removed the region in many places is inaccessible except on foot, as there are no open roads passable to a vehicle.

(Reference: Penna. Second Geological Survey.)

The division lies in the three townships of Gregg, Haines and Penn, Centre county; Hartley township, Union county; and Armagh township, Mifflin county.

All the boundary lines have been surveyed and have since been repainted and posted, the eastern in 1912 and the western in 1913. A few interior tracts remain surrounded by the forest area of 15,000 acres. Portions of this division during 1912 were assigned to foresters Silvius and Meek. There is no virgin forest but two small tracts of mature and hypermature timber still remain, one in Bear Hollow and the other at the east end of White Mountain. The first may cut 100,000 feet of white pine, yellow pine, and hemlock, but is $4\frac{1}{2}$ miles from a railroad at Cherry station. Probably 300,000 feet of the same material could be cut from the east end of White Mountain, but would require to be taken down the mountain on a slide, floated in Penns Creek, and loaded in cars at Johnson's siding, two miles distant; otherwise it must be hauled to Cherry station. The average price for lumber of this quality on board cars is

White pine,	\$28.00 per M.
Yellow pine,	17.00 per M.
Hemlock,	19.00 per M.

The two tracts cover an area of about 1,200 acres. After improvement, a sufficient number of seed trees would remain for natural regeneration.

Of the remaining area, 6,700 acres possess a density greater than 50 per cent. It is set with white oak, black oak, red oak, chestnut of about 13 years old, with scattered mature white pine, yellow pine, pin oak, and chestnut. The old trees are needed for seed purposes. Normal and uniform density will be maintained by protection and improvement cutting. The area having a density of from 10 per cent. to 50 per cent. will amount to about 3,500 acres, containing scattered chestnut, hickory, white pine, yellow pine, and oak. With protection from fire and grazing, planting, where it may advantageously be done, will bring it to normal density. The scrub oak and brush covered area amounts to about 3,000 acres. A few mature trees are scattered about on the area. Much of this area must be planted. On 10 acres probably no natural regeneration can be expected. Streams cover an area of about 30 acres; roads and trails 56 acres; fire lanes 10 acres. Only the open ground and the areas with a density of less than 10 per cent. are available for planting at this time. Protection in this region is the leading proposition. It exceeds planting in importance and is likely to for some time.

Springs and Streams.

All the large springs have been cleaned and improved. New springs are opened where water outlets are discovered. All are ac-

cessible and in good condition and few of them go dry at any time of the year. Streams are numerous and large, Penns Creek being the largest and receives the flow of all others. Their flow is regular, but all are influenced by unusual heavy rains or fast melting snow. All are free from contamination except Penns Creek.

Buildings and Repairs.

The division contains but one building belonging to the State, a log cabin at the junction of Poe Valley. It will relieve from the expense and burden of moving a tent and maintaining a camping party when work is to be done in that region. While in charge of the Poe division, the forester built a cabin at Stone Creek and two lookout towers, one on Joe's Knob and one on Sand Mountain. Minor repairs were made to the ranger's home on this division. The Commercial telephone has been installed in the ranger's residence at Potters Mills, and during the short time it has been there it has paid for itself many times over. At Coburn the forester has both the Commercial and the Bell telephones.

Roads.

During 1912 $24\frac{1}{4}$ miles of old roads were brushed and improved, 6 miles of new road partly cleaned. On the Poe division $3\frac{1}{4}$ miles of new roads were built in 1913, $2\frac{1}{4}$ miles of old roads graded and repaired, and 6 miles of new fire lanes cut out. During the year the following road work was completed on the Coburn division: $4\frac{1}{2}$ miles of new road cut out; $1\frac{1}{4}$ miles of new road graded; 1 mile of old road graded; $27\frac{1}{4}$ miles of old road brushed out; $2\frac{1}{4}$ miles of new fire lanes cut out, $12\frac{3}{4}$ miles of old fire lanes brushed out.

Plantations.

During 1912 45 acres were planted and reinforced, using 80,000 seedlings of the following species:

White pine, 3-year,	60,000
Scotch pine, 2-year,	10,000
Red oak, 1-year,	10,000
	<hr/>
	80,000

In 1913 on the Coburn division 40 acres were planted with two year old white pine, using 100,000 seedlings. They were placed principally in the East Pine Swamp region which was burned over in 1909.

To date the Coburn division contains the following plantings, covering 165 acres.

White pine,	Planted 1910,	128,000
White pine,	Planted 1912,	60,000
Scotch pine,	Planted 1910,	62,000
Scotch pine,	Planted 1912,	10,000
Sugar maple,	Planted 1910,	7,000
American ash,	Planted 1910,	20,500
Black walnut,	Planted 1910,	12,000
Red oak,	Planted 1912,	10,000
White pine,	Planted 1913,	100,000
		<hr/> 409,500

Nurseries.

The nursery at Weiker was established in May 1912 on property belonging to Ranger Libby. He sowed therein $\frac{1}{4}$ pound each of white pine, Norway spruce, and red pine, and a small quantity of Douglas fir. At the end of the season he had 800 red pine, 700 Douglas fir, and 1,500 Norway spruce. Sparrows scratched out and destroyed all the white pine seedlings.

In 1913, one pound each of red and white pine seed was sown and all the one year seedlings were transplanted. Frost had heaved out a number of the seedlings and those left to be transplanted numbered only:

Norway spruce,	400
Red pine,	200
Douglas fir,	200

Much of the seed sown in 1913 was eaten by birds so that an inventory in the fall of 1913 shows the following only:

Norway spruce, 1-1 year,	400
Red pine, 1-1 year,	200
Douglas fir, 1-1 year,	200
White pine, 1 year,	500
Red pine, 1 year,	500

This nursery is for mere demonstration and educational purposes and is not expected to furnish large quantities of seedlings.

Labor.

Labor may be had for 15 cents an hour and is abundant. Teams with driver cost from 30 cents to 40 cents per hour, without driver

from 20 cents to 30 cents per hour. The region is a farming community and there are no industries nearby to raise wages. A few small lumber operations pay wages at the same rate. Labor is good in quality and the men are reliable.

Markets.

There is small local demand for lumber or timber of any kind. Much fuel is used but nearly all have their own woodlots or buy waste from the mills. Railroad rates are satisfactory. Most of the shipping is done from Coburn. The following table will give an idea of the prevailing prices and the quantity shipped from this station:

White pine,	450,000 board feet,..	\$28 00 per M.
White oak,	200,000 board feet,..	23 00 per M.
Hemlock,	250,000 board feet,..	19 00 per M.
Mine props, yellow pine,	500 tons,	3 10 per ton.
Bark, hemlock,	600 tons,	8 00 per ton.
Oak laggings,	60,000	12 00 per M.
Paper wood,	230 cords,	6 00 per cord.
Extract wood,	280 cords,	2 60 per cord.
Oak and chestnut railroad ties,	6,000	55 each.

There are in this division many small patches of living and dead trees better out of the forest than in it.

Improvement cuttings.

Improvement work consisted of the removal of dead and down timber for fuel, extract wood, paper wood, and lumber. In this effort 2,500 acres were cleaned up.

Topographic and Stock Survey.

The Topographic and Stock survey of this division was started the latter part of 1913. The preliminary work is proceeding satisfactorily.

Insects and Fungi.

There are no serious insect attacks. The chestnut blight has been found distributed generally over the forest. Over 400 diseased trees were discovered, cut, and destroyed.

Forest Fires.

There were no fires on State land during 1912, but four occurred on private land nearby, and all were fought by the forest officers. Two of them are of unknown origin while two others are believed to have been set by the railroad. The damage in each case was severe.

Four fires are reported for this division for 1913. One of them burned on both State and private land while the remaining three were upon private land only. State land was burned to the extent of 200 acres. The origin of this fire was lightning. The railroad is believed to have set two others on private land and one is unknown. The railroad section hands helped to extinguish all the fires believed to have their origin from the railroad. The attitude of the people of the neighborhood is correct with respect to fires. They respond readily and do their very best to help extinguish them. The railroad in this region has many steep grades and an accompanying photograph shows how easy it is for an engine on an up grade to set fire to the woodlands. Fire towers thus far built on the Poe division have been of great assistance in locating fires.

Outing and Recreation.

Hunting and fishing are good in this locality. 14 camping parties were located on State land during 1912. 24 deer and 15 bears were reported taken on State land and in the neighborhood. Grouse, turkeys, and smaller game were found to be abundant. A camp of boy scouts enjoyed a week's recreation within this forest.

Ten different permits were issued, 6 for campers and 6 for hunters, during 1913. 9 deer were taken, one elk was killed in Zieglerville, 3 bears, rabbits, pheasants, and other small game were killed. Most of the streams are well stocked with trout and the fishermen are abundant. The camp sites on the division will be numbered from 201 to 299 inclusive. Thus far ten have been located, numbered, and posted.



29. THE SEVEN MOUNTAIN FOREST, GREENWOOD DIVISION.

Forester, Tom O. Bietsch, McAlevysfort, R. D. No. 1.

Forest Rangers:

G. Edward Ross, McAlevysfort, R. D. No. 1.

James H. Howard,¹ McAlevysfort, R. D. No. 1.

John Monsell, Reedville, R. D. No. 1.

Frank A. Gibboney, McAlevysfort, R. D. No. 1.

Howard J. Roop,² McAlevysfort, R. D. No. 1.

Roy Ross, McAlevysfort, R. D. No. 1.

The headquarters of the forester on this division are at the site of the old Greenwood Furnace, formerly operated by the Logan Iron and Steel Company.

This division is located 2,000 to 2,400 feet above sea level, having valleys from 700 to 900 feet elevation. Fossil iron ore abounds. Veins of it were opened prior to 1835. A furnace was erected in 1834 at Greenwood and the ore hauled across the mountains. In 1864 a second stack was built. For over 70 years the forest was worked on a charcoal rotation of 25 years. Around Greenwood there grew up a village composed of charcoal burners, teamsters, and furnace tenders. The State acquired the region in 1904.

This area is subject to early and late frosts. Spring is usually from one to two weeks behind the adjoining territory.

The area of the division was about 35,000 acres. By attachments to other divisions it has been reduced to 23,000 acres. The boundary line has been completely surveyed with the exception of about half a mile. The character of the tree growth is thrifty and natural seed regeneration will replace the trees removed by lumbering provided proper protection be afforded. There is virgin forest of about 200 acres. A few mature and overmature trees are found along the summit of the mountains where improvement cutting could not be carried on profitably. About 500 acres of this area are covered with a scrub growth and another area of about the same size consists of rocky batters. Some fire killed timber still remains on the land and would produce probably 400 cords. But a small area remains for artificial planting, not in excess of 26 acres. The water surface equals 30 acres, roads and trails occupy 82 acres, and 42 acres are employed for fire lanes.

¹Resigned September 30, 1912.

²Appointed April 1, 1912.

Forester George A. Retan was in charge of this division from the 15th day of June, 1911 to the 1st day of September, 1912, when he was transferred to the State Forest Academy. The report of a portion of Mr. Retan's planting and other activities is contained herein.

Springs and Streams.

This division is favored with a dependable supply of water from mountain springs, all of which have been cleaned and made accessible. The supply of water in this forest is exceptionally good. During the severest droughts a number cannot be used. Empty oil barrels are suggested as reservoirs in these regions. Streams are regular and free from contamination.

Buildings and Repairs.

During 1913 improvements were made at the Barrville property and the Saeger farm. The former is occupied by Ranger Monsell and the latter by Ranger Gibboney. Both are now in good and habitable condition. Repairs were also made at the forester's house, at the Griffith home, at the Stone house, and at the barn. Much of the work was done by the forester and his rangers. Telephone connection exists with Lewistown. The trunk line of the American Telegraph and Telephone Company passes through the division.

Roads.

During 1912, $8\frac{1}{4}$ miles of old roads were brushed out for the first time and $17\frac{3}{4}$ miles were re-brushed or improved. A new road was built for a distance of $3\frac{1}{2}$ miles and new fire lanes opened for $12\frac{1}{2}$ miles. The total number of public roads open and suitable for travel at this time within the division is $31\frac{1}{2}$ miles; trails $\frac{3}{4}$ of a mile; fire lanes $24\frac{1}{4}$ miles.

To protect further from fire, an exposed thread of soil $2\frac{1}{2}$ feet wide was made in the centre of all trails and fire lanes where deemed most important. This makes it easier to run a back fire and to reach fire lines more quickly. It makes a safe fire lane when the fire is under control. Much patrolling then becomes unnecessary. It reduces the cost of maintenance and eases travel.

Easements.

One pasture lease is outstanding and the lumbering operation of H. C. Brungard is in progress.

Minerals.

The presence of fossil iron ore is before referred to. There is a cropping of limestone on the property at Barrville. A stack of lime was burned and will be used in the farm operations at the headquarters. The lime was produced at the cost of the labor only, and much cheaper than it can be purchased in the locality.

Seed Collection.

During 1912 the forester collected the following seeds from trees growing on the division:

- 42 bushels of white pine cones yielding 36 pounds average quality seed.
- 4 bushels of yellow poplar cones.
- 57 bushels of black walnuts.
- 12 quarts of wild black cherries.

The above seeds were used for planting in the spring of 1913.

In 1913, 50 bushels of red oak acorns were collected in Mifflin county, costing 50 cents per bushel. All were sown in the local nursery.

Plantations.

The following seedling trees were planted during 1912:

White pine,	23,300
White ash,	736
Red oak,	786
Catalpa,	824
Pinus ponderosa,	1,600
Scotch pine,	200
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Total,	27,446

The plantations during 1913 were as follows:

White pine, 2-year,	47,000
Scotch pine, 2-year,	11,800
Red pine, 2-year,	17,000
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Total,	75,800

The plantings on this division to date have been as follows:

White pine,	497,383
Scotch pine,	37,500
European larch,	1,500
Pitch pine,	21,500
Pinus ponderosa,	2,600
Red pine,	17,000
White ash,	2,916
Red oak,	786
Black walnut,	300
Catalpa,	824
Hickory,	167
Carolina poplar,	5,000
California privet cuttings,	5,000
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Total,	592,476
Black walnuts,	12 bushels

Nurseries.

(See report under "State Forest Nurseries.")

Sample Plots.

An experimental planting of 4½ acres of black walnut was made in 1906 on this division. In 1907 the records show that it was refilled. Subsequent growth was unsatisfactory and the plantation proved to be unsuccessful. Recently white ash has been substituted for it and planted on the area. The Carolina poplar cuttings likewise proved a failure. Some of the European larch planted on a hill proved a failure.

Labor.

For ordinary labor in the nursery 12½ cents per hour is paid. Work in the mountains is paid for at the rate of 15 cents per hour. A team with driver is worth 30 cents per hour and without 15 cents.

The labor problem is becoming a serious one on this division. The employment within the State Forest is not regular and it is difficult to hold men unless they have regular employment.

Improvement Cutting.

An improvement cutting has been started in Greenwood hollow, where there is thrifty growth, inferior species, and considerable suppression of growth. The work is done by residents in the neighborhood, who receive wood in pay for their labor.

Market Conditions.

This region is remote from a ready market and about the only sales consist of dead wood used in the neighborhood for fuel. This material is cut and hauled by the purchaser. All cutting is done under the direction of the forester. No utilization of small material is made. Coal is cheap and hinders the economic development of the forest. The nearest railroad is 5 miles distant, with a freight rate of 8 cents per hundred.

Insects and Fungi.

Little loss was occasioned from either of these causes. The damping off fungus was controlled by wood ashes. The work of the June bug larvae was controlled by fall plowing and collecting adult beetles. The white pine weevil is the most troublesome. The plantation at the Saeger farm was attacked and many of the trees had to be topped. This plantation is thrifty, showing a diameter growth of from $2\frac{1}{2}$ to 3 inches, and a height growth of from 4 to 9 feet. An annual height growth of 30 inches is found.

The chestnut bark disease has appeared at several places on Stone mountain. All infections as discovered are destroyed.

Forest Fires.

During the year 1912 no forest fires occurred within this State Forest. Two small fires on private lands were extinguished by the employes of the Department. Three fires on State land are reported for 1913, covering an area of about 40 acres. The most severe fire destroyed about 75 per cent. but was limited to 10 acres. The adjoining foresters and rangers helped protect this area. An observatory station is about to be established on Brush ridge at Greenwood.

Outing and Recreation.

60 permits were issued during 1912 to hunters and fishermen, giving authority to nearly 500 persons to camp on State land. So far as known there was but a single violation of the law, the killing of a doe. What evidence existed relating to this offense was furnished to the Game Commission. During the season 24 deer, 2 bears, and a large quantity of small game were taken.

Camps on this area have been numbered from 301 to 399 inclusive.

24 camps were established during the season of 1913. These, with hunters and fishermen, will possibly bring the total number up to 400. 20 deer, 3 bears, 58 pheasants, 182 squirrels, and many rabbits were reported taken in this neighborhood.

Fishing is good in the streams of the region and large numbers of persons visit it each year for that purpose.

Lightning Report.

During 1912 the following trees were struck and shattered:

	June.	July.	August.	September.	Total.
Pitch pine,	3	4	.....	.....	7
Chestnut,	2	2	.....	.....	4
Cherry, .....	.....	1	.....	.....	1
White pine,	2	1	.....	.....	3
Pin oak, .....	.....	1	.....	.....	1
Red oak, .....	.....	1	.....	.....	1
Hemlock, .....	.....	.....	4	.....	4
Telephone pole, .....	.....	.....	.....	1	1
Total, .....	.....	.....	.....	.....	22

In July one yellow pine was struck and ignited.

31 cases of lightning stroke are reported during the year 1913. In 30 cases the trees were struck and shattered, and one yellow pine was ignited. The prevalence was as follows:

May,	1
June,	2
July,	18
August,	9
September,	1
	<hr/>
	31

The species struck were as follows:

Red oak,	1
Pin oak,	3
Chestnut,	5
Poplar,	1
Rock oak,	1
White oak,	4
Gum,	2
Hemlock,	11
Yellow pine,	2
Apple,	1
	<hr/>
	31

30. THE SEVEN MOUNTAIN FOREST, JACKS MOUNTAIN DIVISION.

Forester, W. Gardiner Conklin, Troxelville.

Forester, John R. Elder, Troxelville.

Forest Rangers:

James Middleswarth,* Troxelville.

Charles J. Middleswarth, Troxelville.

William H. Ettinger, Troxelville.

William C. Maurer,† Troxelville.

The Jacks Mountain Division is at the eastern termination of the Seven Mountains in Snyder and Union counties, and comprises 19,429 acres, 11,965 of which are in Snyder county, and 7,464 acres in Union county.

James Middleswarth was appointed a ranger October 15, 1904. He was the first officer on this division and one of the oldest in the service both from the point of age and years of service. He is one of the rank known as the "Old School," real pioneers in Pennsylvania forest operations. A competent surveyor, Mr. Middleswarth served the Department well, making numerous surveys in that region. His increasing age and consequent infirmity are responsible alone for the change. Knowing the residents of his neighborhood he was able to treat with them in a most satisfactory manner and first solved the grazing problem. Timber stealing and other forms of trespass are at a minimum owing largely to his influence and vigilance. He was in demand throughout the region for the correction of lines and locations. His work was accurate and always to be relied upon. With the coming of the forester, he was of great assistance in enabling the latter to make his way satisfactorily.

Forester W. G. Conklin was transferred temporarily for topographic and survey work in the Department offices. John R. Elder, forester, was placed in charge September 1, 1913.

The exterior boundary has been surveyed and the lines marked and painted. The brush has grown and it will be necessary to open them within a short time. This will involve about 65 miles of line.

There are about 300 acres of original forest growth on this division, 200 acres of it being in Swift Run valley and composed almost wholly of virgin hemlock with some white pine and a few broad leaf

*Resigned September 30, 1913.

†Began since March 1, 1913.

species. It is estimated that this tract alone contains two and a half million feet of lumber. A good road is nearby, making it accessible to market. From a financial point of view this timber is ripe and will bring the highest return in the market at the present time. Owing to the scarcity of virgin stands of timber in the Commonwealth, there is no desire on the part of the Department to have it cut. A quantity of virgin pitch pine is scattered over the west end of the valley covering several hundred acres, here and there a small tract of original growth. These remain because of the difficulty of lumbering them when the region was passed over for that purpose.

During a portion of 1912 the forester in charge was engaged in the collection of statistics for the publication on the wood-using industries of the State, beginning late in July and closing the work about the middle of October. The territory covered included Lebanon, Blair, Huntingdon, Mifflin, Juniata, Centre, Clearfield, Somerset, Cambria, and Bedford counties. Some time was spent in Pittsburgh and also in Washington assisting there in the editing and tabulation of the reports.

A lot of dead and defective pine and hardwoods in Hartley township should be removed, and a contract for its removal exists with William H. Libby of Millmont, who pays the following prices:

Saw timber,	\$5.00 per M. mill cut
R. R. ties, according to grade,	30c, 20c, 10c
Prop timber,	\$1.00 per ton
Pulp wood,	\$1.00 per cord
Extract wood, .....	.50 per cord

The limit of the contract is three years.

Springs and Streams.

All springs which may be made useful are now accessible from roads and trails. Important ones were posted and named. Most of them are in good condition. A few dry up during the summer but resume flow in the fall. There is almost no contamination.

Buildings and Repairs.

A small unoccupied house in this forest is useless under present conditions. If replaced by a proper house it would make a good site for a ranger's home.

A small house occupied by Ranger Ettinger is inadequate for the purpose and can no longer be used as a residence. Another cabin is falling into decay, but a few repairs will retain it for a short time.

Roads.

During 1912 1.6 miles of old roads were brushed out for the first time and 14.55 miles of old roads were repaired and made drivable. An additional length of 12.34 miles was partly improved, but owing to steep grades and roughness, are not in good condition for driving. New fire lanes were opened for a distance of 1.56 miles, and old lanes were rebrushed for a distance of 1.4 miles.

In 1913, 32.02 miles of roads were repaired, sprouted, and mowed; 30.21 miles of trails were sprouted and mowed; and 4.06 miles of fire lanes, a total distance of 67.04 miles.

Labor.

This division has no permanent labor force, all labor being procured by the day. In 1912, the men boarded themselves at their homes and received \$1.50. In 1913 they demanded the same wages and board. Labor is abundant in the spring and becomes scarce about the middle of the summer. By this time arrangements usually are made with nearby farmers or lumbermen for a few days' or weeks' steady work.

Markets.

Nothing but building lumber is called for in the neighborhood. Nearly every farmer has his own woodlot and cuts his own material. Another product is car stuff. Ties, mine props, telephone and telegraph poles, acid and pulp wood are shipped. Little hemlock bark goes by rail. Most of it is hauled to the tannery at Middleburg. The haul is from 6 to 12 miles in the southern portion, and 1 to 8 miles in the northern portion. Rates are variable and to principal shipping points are as follows:

Harrisburg,	per ton,	\$1.60
Williamsport,	per ton,	1.65
Wilkes-Barre,	per ton,	1.75
Shamokin,	per ton,	1.34
Mt. Carmel,	per ton,	1.45
Northumberland,	per ton,	1.25
Nanticoke,	per ton,	1.70
Millersburg,	per ton,	1.35

The rate for hemlock bark is as follows:

Harrisburg,	\$1.25
Sunbury, .....	.75
Middleburg, .....	.65

Insects and Fungi.

The usual insects are present in this forest but are doing no appreciable damage. The bark disease of the chestnut is present with a 1 per cent. degree of infection, and although nothing was done to check it in 1913, little spread of the disease was noticed. In 1912 the eradication of the chestnut blight was pursued vigorously. Over 4,000 acres of the forest were searched and all diseased trees destroyed.

Forest Fires.

One forest fire occurred on State land during the year 1912, and sprang out from a fire which was kindled for the purpose of burning blighted chestnut wood. The area burned over was about 175 acres, but little damage resulted. A few trees were scarred at the base and the upper surface of the leaves only was burned.

Two fires occurred during 1913, both in April, and covered an area of 2,400 acres. Both are believed to have had incendiary origin.

Trespass.

One case of trespass occurred during the year, that by William Douty, who cut 5,111 feet of pitch pine on the Mary Albright warrant. Claim was made to Mr. Douty for three times the value of the material taken under authority of the law governing such cases. He has paid the claim in full.

Topographic and Stock Survey.

A topographic and stock survey in this division is being carried forward. A map has been prepared covering this division and a portion of the Coburn and Kishacoquillas divisions. It shows the location of all the mountain streams, springs, roads, trails, and fire lines; county and township lines are indicated; cabins and camp sites are marked.

Outing and Recreation.

During 1912, 10 permits for camps were issued into this forest, 8 of which actually located. Grey squirrels and rabbits are on the increase. One deer was killed during the season and two bears. Pheasants and wild turkeys were only moderately plentiful.

All camp sites will be numbered from 401 to 499 inclusive. 13 permits were issued during 1913 for 8 different camp sites. The forester assisted in locating 7. 16 persons camped for fishing and 41 for hunting. Two deer, 1 bear, and 2 cubs were reported killed.



Small game was abundant and seems to be increasing. Swift Run was stocked with trout. Numerous water snakes are believed to be responsible for trout destruction. Fishing cannot be said to be good.

Forester Conklin reported to the office of the Department January 8th and first completed his 1912 report for Jacks Mountain Division. Began planning the work for Mensuration and Silviculture and collecting nursery and plantation data. Being still in charge of the division, he returned to headquarters at Troxelville at stated times.

On January 23rd, with Forester Emerick, he was present at an inspection of locomotives of the Buffalo and Susquehanna Railroad Co. at Galeton. The Conservation Commission of New York was represented by W. F. Purcell and the railroad by the Chief Fire Inspector, C. H. Heath.

Prepared additional blanks for the keeping and study of nursery records. Fertilization experiments in the nursery having been undertaken as a result of a discussion growing out of the Foresters' Convention, the nurseries at Asaph, Mont Alto, and at Greenwood were visited in company with Prof. Netoffsky, and the experiments as outlined by him are now being tried. Some interesting material was collected concerning reforestation experiments being made by various foresters.

Assisted in gathering hemlock seedlings at Ansonia and in lifting and bunching seedlings at the Asaph nursery. Was in attendance during the forestry exhibit at Philadelphia throughout the week, and helped ship the material back to Harrisburg.

Plans for topographic and stock surveys about to be undertaken were prepared in June, July, and August. Report thereon is contained elsewhere.

Visited the foresters in charge of lands in Mifflin, Huntingdon, Perry, and Franklin counties and discussed with them the plans for making topographic and stock surveys.

Assisted Forester Elder in becoming acquainted with the Jacks Mountain division from time to time, remaining with him as much as seemed to be necessary.

Assisted Forester Bodine in a survey of the proposed site of the forester's house in the Rothrock Forest.

Some studies in natural regeneration were made. The illustration herewith shows pitch pine in Lycoming county. Frost injury to young trees was noticed throughout the northern part of the State. The injury to white pine in Potter county is also illustrated. The drooping of the main shoot and its subsequent straightening leaves a very decided crook in the stem.

The practice of forestry in the Crossfork region by the farmers of the neighborhood is an interesting historical fact which might well be made the subject of further study.

During October, November, and December of 1913, was engaged almost constantly with the topographic and stock survey work then started on several divisions of the Seven Mountain Forest.

31. THE SEVEN MOUNTAIN FOREST, KISHACOQUILLAS DIVISION.

Forester, D. Kerr Warfield, Milroy.

Forest Rangers:

H. J. Dean, Milroy.

T. L. Swartzell, Milroy, R. D.

William Wirth, Milroy.

This division of the Seven Mountain Forest is situate in Mifflin and Snyder counties and is divided into four ranges, the Wirth, Havice, Treaster, and New Lancaster.

The ranges have been divided into 10 blocks for convenience in administration, and are as follows:

Wirth Range, ....blocks	1, 2, 3; area	7,000 acres
Havice Range, ....blocks	4, 6, 5; area	8,000 acres
Treaster Range, ..blocks	7, 8, 5; area	8,000 acres
New Lancaster		
Range, .....blocks	9, 10, 5; area	10,800 acres

The exterior boundary survey has not yet been completed but the lines are comparatively well known, painted, and posted. The lack of survey causes difficulty in management, and its early completion is a matter of some moment to work within the division.

A small area of virgin hemlock still persists in Block 8, amounting to about 150 acres. Two acres of virgin pitch pine are contained in Block 2, and 80 acres of the same species in Block 9. Much of the hemlock is hyper-mature and would produce at least 1,000,000 board feet. For the present, however, it is inadvisable to place it on the market, because it surrounds the headwaters of a valuable stream, the soil is loose, and natural regeneration would be difficult.

The material is 13 miles from a railroad. Its removal would require the building of at least 2 miles of good earth road, and the expense would be greater than the sale would warrant.

The pitch pine mentioned above should cut 525,000 board feet. Both these stands are mature but show few signs of decay. It is, therefore, inadvisable to market the material until the local private supply has been more nearly exhausted.

That portion of this forest which has a density of 50 per cent. or greater and in which improvement cuttings ought to be made at an early date, would produce the following quantities of material:

Hemlock,	1,100,000 board feet
Pitch pine,	600,000 board feet
Mixed hardwoods,	300,000 board feet

The remainder of the area having a density of less than 50 per cent. will be brought to a normal density by planting seedlings, although it is recommended that broadcast seed sowing be tried because of the character of the soil.

Springs and Streams.

This division of the State Forest contains 12 large springs and several smaller ones. All have been cleaned and repaired, and if located off the main roads have well kept trails leading to them. During 1912 these springs had continuous but variable flow.

The principal streams on the division are Laurel run, Cooper's Gap run, New Lancaster Valley creek, Treaster Valley creek, Havice Valley creek, Weikert run, and Panther run.

The towns of Milroy, Reedsville, Yeagertown, Burnham, and Lewistown receive their water supply through the Lewistown, Reedsville, and Milroy Water Company from Laurel Run, Cooper's Gap Run, and Treaster Valley Creek on State lands. The only possible source of contamination is in Treaster Valley, where the stream flows through a farming region and cattle occasionally have access to the water above the reservoir. In 1913, because of drought, the water company had to enforce a restricted use of water.

Buildings and Repairs.

There are two abandoned farms and two sets of buildings within this division, one in Treaster Valley and one in New Lancaster Valley, the former being occupied by Ranger Swartzell and the latter by Ranger Dean. The house in New Lancaster Valley was temporarily repaired during 1912. A combined stable and shelter were built in Treaster Valley.

In 1913, extensive repairs were made in New Lancaster Valley. It is now one of the best and most comfortable places in the neighborhood. The buildings in Treaster Valley are now in fair condition, having been painted during the year and a new roof placed upon the house. It is not the custom in this region to paint farm buildings. The State buildings, therefore, are in great contrast to those of private owners. The repairs at the New Lancaster Valley farm, counting the time of the forester and the rangers, amounted to \$225.71, and are very cheap at the price. The building of a telephone line to connect forest headquarters with the rangers has been begun.

The lines of the Bell Telephone Company and the Commercial Telephone Company cross the west end of the division for short distances. Because of their location they are of little service at present.

Roads.

Work during the summer of 1912 was carried on by the two rangers on the Treaster Valley road east of Bear Gap. 6 miles of old roads were brushed out for the first time and 17 miles rebrushed and repaired. 1 mile of new fire lane was opened and a mile of new road brushed and partly completed. The total number of miles of opened highway on the division at that time included

- 51 miles of road
- 9 miles of trail
- 3 miles of fire lane
- 3 miles of boundary line

The improvements on the Treaster Valley road, which is rough and one of the worst in the division, consisted of repairing culverts, building of fordings, and covering about 40 rods of surface. 4 bridges were repaired across Laurel Run and in the western end of the division all silt was removed from drains and culverts. In a number of places the surface of the road was smoothed by breaking the larger stones.

In 1913, 57 miles of roads, trails, and fire lines were repaired. The work consisted principally of grading, brushing, and the opening of drains. When once these roads are properly drained, expense for repairs will be reduced. A new road $1\frac{1}{2}$ miles long was constructed and has already proved its great worth. There exists a necessity for more trails to be used in fire fighting.

Plantations.

During 1912, 46,000 2-year old seedlings of white pine were planted, filling in vacant places and small areas.

In 1913, 9.7 acres were planted with white pine and .7 of an acre with red pine. Plantations previously made, some of them under adverse conditions, show a growth of 94.5 per cent. in Treaster Valley, 93.7 in Lingle Valley, 97.4 in Lancaster Valley. The Havice Valley plantation of 1911 shows 82 per cent. of seedlings alive and the Treaster Valley planting of 1912 42 per cent. only of living seedlings. To date there has been planted on this division trees as follows:

White pine,	278,000
Red pine,	2,000
Lemley willow,	500
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	280,500

covering an area of 141.4 acres.

The plantations are in general good condition, although there have been some losses owing to drought and the trespassing of cattle. Some of the trees were received in bad condition owing to delay on the part of the railroad, and much of the loss must be attributed to this cause.

Nurseries.

A small experimental nursery was established in New Lancaster Valley and was first planted with white pine seed. Owing to drought, the damping off fungus, and the trespass of barnyard fowls, it contained only 980 seedlings. Of these only 500 survived the winter. 2,800 willow cuttings were taken from the plantation made in 1911 and a new plantation established.

Sample Plots.

A small plantation for experimental purposes was made in New Lancaster Valley using 500 Lemley willow in the spring of 1911, covering an area of 800 square feet. During 1912, the growth was such that nearly 3,000 cuttings may be made for planting here or elsewhere.

Labor.

Owing to the demand for labor throughout 1912, the rate of wages rose from 15 cents per hour to 17½ cents. There is sufficient work upon the State Forest to have a regularly employed labor force. Light thinnings need to be made here and there, and road, trail, and fire lane work should be extended more rapidly than it is at present going on. Because of the nearby industries offering continuous em-

ployment and the local saw mills which will be in stock for a reasonable length of time, it is more than difficult to procure labor for temporary work only.

In 1913 the price of labor went to 20 cents per hour.

Improvement Cuttings.

Some fire killed timber and other useless material on the west end of the reserve would yield approximately 500 cords. There is little demand for this wood, and what market exists is supplied by nearby farmers, all of whom have mountain woodlots. The distance to market is prohibitive in the matter of working out this material at a profit for the present. In the east end of the division there is approximately the same quantity of timber which ought to be removed. A small amount of cutting has been done.

Market Conditions.

There is a market for timber, but because of the distance it must be moved to the railroad, practically whatever profit is yielded would be eaten up by the expense. The nearby local mills find a ready market with the Pennsylvania Railroad Co. The Kulp Lumber Company at Shamokin, the Whitmer Company at Sunbury, the Oak Extract Co. at Newport, and the paper mills at York Haven and Lock Haven would absorb all such material which ought to be removed from State land could the operation be carried on without loss.

Erosion.

The soil of this region is light and thin on Medina and Oneida sandstone. The removal of the original timber cover permitted the eroding of the hillsides and much of the former thin layer of soil has now disappeared. When the original timber stand was intact, it is known that a heavy layer of humus supporting a good natural regeneration of trees was present and covered all loose rocky areas. Today this has disappeared. There are acres of rocks without any soil cover whatever. Tree regeneration of any kind, natural or artificial, is therefore at a decided disadvantage.

Insects and Fungi.

The usual forest fungi are at work here as elsewhere, attacking and destroying the injured or fire killed timber, although to date no great damage has resulted. The chestnut bark disease is present but is not general in its attack.

Forest Fires.

There were no forest fires on this division during the year 1912. Three forest fires occurred on State land during 1913, two of them of considerable magnitude and covering a total area of 4,300 acres. The drought prevailing at the time and the absence of a suitable fire line as a base, explains the large area covered. The origin of the fires is not known.

Outing and Recreation.

During the hunting and fishing season 35 permits to camp were issued into this division in 1912. The streams are well stocked with brook trout but are equally well fished. Deer and bear are abundant on the State Forest. Two-thirds of the permits issued were for hunting parties. It is known that 25 deer and 1 bear were killed on the division during the season.

30 permits were issued during 1913. 20 deer and an elk were reported shot. All camp sites will be numbered from 501 to 599 inclusive. 19 such sites have been prepared to date.

Lightning Report.

Report on the damage by lightning during the year 1912 is as follows:

	May.	June.	July.	August.	September.	Total.
Red oak,	2	.....	2	.....	.....	4
Yellow pine,	2	.....	1	1	.....	4
Hemlock,	2	1	.....	.....	.....	3
Chestnut, .....	.....	2	1	1	.....	4
Wild cherry,	1	.....	.....	.....	.....	1
Black oak,	2	.....	1	.....	.....	3
Rock oak, .....	.....	.....	.....	1	.....	1
White pine, .....	.....	1	2	1	.....	4
White oak, .....	.....	.....	.....	.....	1	1
Total, .....	.....	.....	.....	.....	.....	25

So far as known, no trees were ignited by the current.

42 strokes of lightning were counted during 1913. The periods of frequency were as follows:

May,	14
June,	15
July,	4
August,	3
September,	3
October,	3
<hr/>	
	42

The species struck were as follows:

Chestnut,	10
Hemlock,	2
Black oak,	2
Pin oak,	1
Red oak,	3
Rock oak,	9
White oak,	4
Pitch pine,	1
Yellow pine,	5
White pine,	5
<hr/>	
	42

22. THE SINNEMAHONING FOREST, AUSTIN DIVISION.

Forester, P. Hartman Fox, Austin.

Forest Rangers:

M. A. Fourness, Coudersport R. D. No. 6.

Wesley Hackett,* Austin.

C. M. Head,† Austin.

The Austin Division of the Sinnemahoning State Forest is located in the western part of Potter county and the northwestern portion of Cameron county. Roughly it may be divided into three subdivisions, Odin, Sizerville, and Moores Run. The former Sizerville division has since been separated from this area and erected into a forest in charge of a forester.

The division of the work for protective purposes permits Ranger Fourness to patrol the Odin range and ranger Hackett the Moores Run. The forester himself looked after the then Sizerville subdivision. Ranger Hackett tendered his resignation in October and C. M. Head was appointed as an emergency ranger.

The boundaries are completely surveyed with the exception of a small portion at the head of Bailey Run. Where the survey is completed the lines have been posted and painted. The area of this division is at present about 25,000 acres.

The State Forest in this region abounds in interior tracts. These are small areas of cultivated land along the streams. Some of them are only partly cleared. Danger from fire is augmented by reason of these interior holdings.

There is no virgin forest on this division of the State land and but 50 acres were added during the year. A mature forest with a stumpage content of about 4,000 board feet and 20 cords of wood per acre may be found over approximately 1,500 acres of the area. The species represented are beech, maple, and hemlock, but mainly hardwoods. No market for stumpage exists at present. The nearby wood-consuming plants are idle or going out of business. The prevailing price per thousand feet for logs was \$12.00. The price at Gaines is \$17.00 per thousand feet. 200,000 feet of logs are at present available for delivery. The freight rate is unsatisfactory and unsettled. The mature timber on the forest is of good quality. Portable mills on or near the State Forest would be the most economic way of working up the material. The delivery of the manufactured

*Resigned October 7, 1912.

†Began service October 9, 1912.

product would be less expensive than that of the raw stuff. A maple and beech regeneration is coming on with fine growth. The removal of much of the material that ought to go out could be accelerated. A conservative estimate of seven million feet stumpage is probably fair for the quantity of material which might be removed from this forest at this time. 500 acres of the above lie in a solid block and form a natural compartment. The balance is found in scattered patches. Many of the trees are fire scarred and every year that cutting and marketing is delayed means the loss of merchantable material. The development of the forest to the best silvicultural condition makes the removal of much of this growth imperative. The financial results make it expedient. Such a clean-up will reduce the subsequent fire risk and natural regeneration will have a chance.

Brush and weed growth covers an area of at least 10,000 acres. The remainder is of scattered valuable species and occasionally good tracts. At least 5,000 acres will require planting. Over 100 acres are occupied by streams, 25 acres by roads, and 50 acres by fire lanes.

Springs and Streams.

When the original timber cover was present, this part of the State was well watered. Local opinion confirms the fact that the springs are showing decreased flow. During 1912 there was an abundance of rainfall and stream flow was greater than usual. A rain gauge furnished by the United States Weather Bureau showed that from October 7th to December 31st, 7.3 inches of rain fell during 22 days.

All main springs are cleaned and accessible; intermittent in flow, some of them ceased entirely in 1913 or were greatly reduced. Stream flow consequently is irregular. The Austin pulp mill shut down for lack of water. Contamination of the streams is the rule rather than the exception, except on State land.

Buildings and Repairs.

At present there are no buildings in this forest belonging to the State. The tract is nearly encircled with telephone lines. Ranger Fourness has a pay station in his house. The Bell Telephone Co. enjoys an easement on State land between Austin and Odin. Two of the lines have been built by farmers. A farmers' line connects with the Bell Company near Coudersport, and skirts the northern edge of the forest. Another reaches from Costello to Savoy, with Bell exchange facilities. Bell service is available to the forester at Austin, costing \$1.50 per month. Service is satisfactory.

Roads.

All road work during the year 1912 consisted largely of the extension of fire lines, which were opened for $11\frac{1}{2}$ miles. Much of the time and labor required was expended in the removal of rocks and trees lying within the lines.

The system of main township roads is sufficient for present purposes, but they need to be kept in better repair and should not be abandoned. There seems to be a disposition to do this on the part of road authorities.

A better system of roads may be laid out upon the old township and lumber roads. No road work was done during 1913. Fire lanes to a distance of about 6 miles were improved.

Easements.

The Buffalo and Susquehanna Railroad Company crosses State land for a distance of about 2 miles.

Plantations.

The following seedlings were planted during 1912:

Red oak,	10,000	1-yr.	5 acres
White pine,	103,300	3-yr.	$86\frac{1}{2}$ acres
White pine,	9,200	2-yr.	$7\frac{3}{4}$ acres
Norway spruce,	900	2-yr.	$\frac{3}{4}$ acre
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	123,400		100 acres

All the above plantings were made at distances of 6 feet.

No special preparation of soil was made. It is of good depth and rather free from stones. Repeated burnings had brought up a growth of fire cherry, sumac, and briars. The effect of this weed growth upon the seedlings will be a subject for future study.

Plantings during the year 1913 were as follows:

Norway spruce, 2-year,	28,500
White pine, 3-year,	99,500
White pine, 1-2-year,	1,000
Scotch pine, 2-year,	22,800
Scotch pine, 1-1-year,	2,500
Silver pine, 3-year,	5,000
	<hr/>
	159,300

The area planted to date with seed and seedlings within this forest is 288.5 acres. Seedling trees planted to date are as follows:

White pine,	389,000
Scotch pine,	30,300
Silver pine,	5,000
Norway spruce,	31,400
European larch,	2,300
Red oak,	10,000
White ash,	5,980
Red ash,	5,000
American elm,	3,000
Honey locust,	8,000
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	489,980

2½ pounds of white pine seed were used for spot plantations.

Nurseries.

A small demonstration nursery has been located at Odin, established in 1909. In the beginning it had an area of only one-tenth of an acre, but it has since been slightly enlarged. This small nursery has attracted some notice in the neighborhood and many inquiries are made regarding it. It has been a success in this direction alone. In 1912, it contained the following seedlings:

White pine, 3-2 year,	1,300
White pine, 2 year,	60,000
White pine, 1 year,	8,000
Norway spruce, 2 year,	9,000
Norway spruce, 1 year,	7,000
Scotch pine, 2-1 year,	6,100
Scotch pine, 1 year,	8,000
Red pine, 2 year,	2,500
Red pine, 1 year,	2,500
Douglas fir, 1 year,	3,000
	<hr/>
	107,400

The seed planted in the nursery in the spring was as follows:

White pine,	5 pounds
Scotch pine,	3 pounds
Norway spruce,	3 pounds
Douglas fir,	½ pound
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	11½ pounds

This nursery is to be used principally for experimental and demonstration purposes. No further increase in size is therefore demanded. Experimental plantations are to be made with the seedlings produced.

The educational value of this nursery is marked. Individuals are growing seedlings or making plantings. This part of its real value is to be encouraged and extended.

The small experimental nursery has been increased to an area of .16 of an acre. At the end of the 1913 growing season it contained the following stock:

White pine, 2-1 year,	22,000
White pine, 1-1 year,	1,500
Norway spruce, 2-1 year,	10,000
Norway spruce, 1-1 year,	1,100
Red pine, 2-1 year,	2,000
Red pine, 1-1 year,	250
Scotch pine, 2-1 year,	2,000
Scotch pine, 1-1 year,	500
Douglas fir, 1-1 year,	200
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	39,550

Sample Plots.

All the plantings to 1913 are treated as experimental. The effect of the planting on the scrub growth is to be the subject of future study. The principal fact to be learned is whether planting may be made successfully without previous clearing of the area and preparation of the soil.

One experimental sample plot was made in April, 1913, at the mouth of Jacob's Run, using 5,000 3-year old Silver pine.

Labor.

There is abundant work awaiting labor in this region. The number of jobs exceeds the workers, and wages are high, running about \$2.00 per day per man and \$5.00 a day for a team. In a neighboring hemlock woods labor is paid from \$2.25 to \$2.50 per day with board. The quality of labor is good but hard to get.

Markets.

There is no local market for material except a limited amount of fuel wood. Markets are available at Hull, Johnsonburg, and Austin. The town of Austin consumes about 1,000 cords of wood a year for fuel purposes at a price ranging from \$1.75 to \$2.00 per cord. Timber

in the log may be sold f. o. b. Gaines for \$17.00 per thousand. Paper wood is worth \$5.50 per long cord on board at Austin. The large mills at Austin and Keating Summit supply the local demand for lumber, but their life is limited. The prices paid at the mill are high, \$12.50 per thousand feet for hardwood logs and \$10.00 for hemlock delivered. A pulp mill at Austin is today using refuse hemlock. Transportation facilities are good with railroad stations at Austin, Costello, and Keating Summit. The longest haul to the railroad is ten miles, and all are down grade. 50 cents per short ton is the railroad rate from Austin to Hull, with a minimum load of 60,000 pounds. To market the present reserve stock which should be removed, it would have to be done by portable saw mills. Much of the wood classed at present as weeds is without market anywhere. Forest ranger Head has suggested that the fire cherry be used for the making of berry baskets and similar containers.

Improvement Cuttings.

An improvement cutting made prior to 1912 is showing good results in a more uniform stand in the growing stock. The species is practically pure yellow birch. Other cuttings ought to be made but a lack of market for the product renders such work inexpedient.

Erosion.

Erosion here is not marked because the area has quickly been covered with weeds, brush, bracken, and other vegetable growth. Upon cultivated private land, however, it is very noticeable.

Insects and Fungi.

Owing to the moist and favorable season, an unusual quantity of sap and heartwood rot fungus has appeared during 1912. The black cherry was defoliated by the forest tent caterpillar. A leaf miner attacked the aspens in the late summer. A few white pines were lost from an unknown cause. The chestnut bark disease probably made its appearance in 1913.

Forest Fires.

There were no forest fires on State land during 1912. The largest fire within the region on private land covered 100 acres and originated from sparks caused by burning the flood refuse between Austin and Costello.

In 1913, 13 fires occurred within this region. 12 originated on State land, 5 burning within the forest, covering an area of 725 acres. In some cases the loss was small and in others total.

Trespass.

Two small violations, one of timber trespass and one of fire, occurred during 1913. Settlement of one is in progress and the other hangs upon the procuring of evidence.

Outing and Recreation.

This region has not yet become sufficiently well stocked with a new forest to invite the game, consequently it does not invite the hunter. There is a lack of all large game. Small game, rabbits, grouse, and squirrels, seems to be abundant. Excellent trout fishing may be found within the streams on State land. The people of the neighborhood gather ginseng, raspberries, and black berries. There were no camp permits issued during 1912 or 1913 for any portion of this division.

Lightning Report.

Without being able to specify the month, it was discovered that during the year 13 trees had been struck by lightning, as follows:

Hemlock,	6
Hard maple,	5
Red oak,	1
Black cherry,	1
	<hr/>
	13

14 trees were struck during 1913, one of which, a hemlock, was ignited. 5 hemlocks and 8 chestnut stubs were struck during July and a hemlock in August.

33. THE SINNEMAHONING FOREST, HULL DIVISION.

Forester, H. Lawrence Vail,* Conrad.

Forester, George S. Perry,† Conrad.

Forest Rangers:

A. A. Bennett,‡ Hull.

A. W. Ayres,§ Costello.

The Hull division of this State Forest is not yet well marked. In this region interior tracts, of which there are a number, are of value because their holders have learned to know the value of timber and of preserving it, and are using all proper precautions to prevent and extinguish forest fires.

The boundary survey is incomplete and the exact status of the lines is in dispute in many places. Until survey can be made the forest officers are not at all sure of their rights and limitations. The whole division includes 23,290 acres. There is no virgin forest. All the land has been severely culled. Over an area of 4,000 acres will be found some mature and hypermature trees, including beech, maple, birch, basswood, white ash, cherry, and hemlock. Nearly all has suffered injury from fire, the attacks of insects, and fungi. A density of 50 per cent. and over is found probably on 20,000 acres. Only the mature timber stands and a few of the dense stands of young growth need improvement at this time. 15,000 acres need nothing but protection, and the stand upon 22,000 acres will reach normal density through protection alone. An area of 2,500 acres has a density of from 10 per cent. to 50 per cent.; weeds and briars cover 800 acres. Natural reforestation is occurring but could be greatly assisted by planting. There are no rocky areas upon which planting would be inadvisable. Streams cover 10 acres; roads and trails 31½ acres, fire lanes 32 acres.

Springs and streams.

The division is well supplied with many springs. All are made accessible and a number posted. Where the forest cover is dense the spring flow is steady. On the thin, cut-over lands it varies with precipitation. The removal of the heavy timber cover has caused many of the streams to become dry during the summer season. Some

*Resigned September 30, 1913.

†Appointed September 1, 1913.

‡Resigned November 30, 1912.

§Began service May 1, 1913.

flow underground for long distances and emerge as great springs at lower levels. There is no contamination of the waters except from the town of Hull, but south of Wharton the Sinnemahoning Creek is black with the waste from the paper mill at Austin and the Costello tanneries.

Buildings and Repairs.

The only building owned by the State in the region is a tool house on lands of the Cooperage Company at Hull. Two lines of telephone 9½ miles in length, have been constructed.

The Galeton and Hull Telephone Company operates a line through Hull to Wharton, but the service is unsatisfactory.

Roads.

During the year 1912 three miles of new road were brushed out and partly completed. At present there are open for use 5 miles of public road, 10½ miles of trails, and 7½ miles of fire line.

The road work in 1913 consisted of brushing, and covering a distance of something over 9 miles.

Easements.

The tracks of the Buffalo and Susquehanna R. R. Co. extend through or along the edge of the forest for a distance of 22 miles. The railroad officials and the employes are friendly to the work of the Department. The severe fires in the past have started from the railroad. The Tide Water Pipe Line Co. has an easement for a right of way through a portion of the forest. An easement for a fourth part of the minerals, oil, and gas over a portion of the lands is reserved to the estate of William Bingham.

Minerals.

A few small coal pockets are found here and there located in the upper measures. Oil and gas have been found near the State land.

Plantations.

During 1912 seeds were planted in a small experimental nursery, as follows:

White pine,	5 pounds
Scotch pine,	1 pound
Douglas fir,	½ pound
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	6½ pounds

Seedlings planted were as follows:

European larch, 2-year,	900
European larch, 3-year,	1,900
White pine, 3-year, tr.	25,100
Red oak, 1-year,	3,000
American elm, 2-year,	2,400
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	33,300

During 1913, trees were planted as follows:

White pine, 2-year,	11,500
White pine, 3-year,	60,000
Silver pine, 3-year,	5,000
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	76,500

The total planted area is 48 acres, 37½ of which were made during 1913. The seedlings planted to date are as follows:

White pine,	96,500	
European larch,	2,800	
Silver pine,	5,000	(All failed)
Red oak,	3,000	
Sugar maple,	850	
American elm,	2,400	
	<hr/>	
	110,550	

At places a large area of this forest is covered with millions of seedlings of the hard maple.

Nurseries.

Former ranger Bennett started a small nursery in the spring of 1908, using a tract 50 feet square. The conduct of the nursery was interrupted until the spring of 1911, when 10 pounds of white pine seed, 1 pound of Scotch pine, 2 pounds of Norway spruce, 2 pounds of European larch, and 1 pound of red pine were planted. The germination was poor and the climatic conditions of the summer and winter were against its success. At the end of that year it showed only a content of 5,000 seedlings, as follows:

Scotch pine,	2,500
Red pine,	220
White pine,	1,200
European larch,	630
Norway spruce,	450
	<hr/>
	5,000

In the spring of 1912, 5 pounds of white pine, $\frac{1}{2}$ pound of Douglas fir, 1 pound of Scotch pine were planted and the following is the inventory for that year:

Seedlings 1 year old.

Douglas fir,	2,200
Scotch pine,	4,250
White pine,	9,000

Seedlings 2 years old.

Scotch pine,	800
White pine,	1,000
Norway spruce,	200
	<hr/>
	17,450

The cultivated area of the nursery at present is 1,700 square feet. This nursery is not located on State land, but is an old garden on private land owned by the Cooperage Company. The present location is not the best but probably the best that can be had.

In 1913, 7 pounds of seed of Norway spruce, white pine, and European larch were sown. A small nursery was begun in 1913 by Ranger Ayres in Prouty Run. It covers about one-sixteenth of an acre. These two small areas at present contain the following stock:

White pine, 1-year,	9,418
White pine, 2-year,	6,500
Scotch pine, 1-year,	1,304
Scotch pine, 2-year,	2,100
European larch, 1-year,	9,787
Norway spruce, 1-year,	11,952
Douglas fir, 2-year,	1,050
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	42,111

At present these nurseries are maintained chiefly for their educational value.

Labor.

Wages in the region of this forest have been good. Jobbers paid their men in the woods \$2.00 per day and board. The mill at Hull paid from \$1.75 to \$2.00 per day for unskilled labor. The State has had to pay 20 cents per hour on survey work. Labor within the

State Forest recently has been \$1.65 per day. Team hire ranges from 40 cents to 50 cents per hour and teams are difficult to procure. Ox teams may be had for from 30 cents to 45 cents per hour. The cooperage company will finish its work shortly and move elsewhere. This will make labor scarcer than ever. The labor of the community is of the woods type and used to heavy work.

Improvement Cuttings.

Contracts have been entered into with H. B. Walker and Damon Watson to do certain improvement work under the direction of the forester and a few other contracts are in progress. They are taking out the fungus infested, wind shaken, frost cracked, leaning, and dead trees, and making space for a great number of seedlings to grow into good stock. The material being removed would be worthless and unmarketable within five years.

Markets.

The Kopa Cooperage Co. consumes all sound salable wood of a diameter of 8 inches and upwards. It is probable that a powder manufacturing plant may take the place of the cooperage company after it finishes its work. An acid factory is also probable. This will take the dead and down stuff. The cooperage company has consumed from five million to six million feet per year of all species, specifying beech, birch, maple, basswood, chestnut, and gum principally of 8 inches in diameter and of any length. The prices at the mill are \$13.00 per thousand delivered. Stumpage ranged from \$2.00 to \$3.50 according to location. All kinds are called for by the wood industries at Galeton, Hull, Austin, Costello. The best and most accessible stands have already been taken. Cord wood is bought by the chemical and paper companies. Logs are taken by the Galeton mills and the cooperage plant. Hemlock bark is called for by the tanning companies. Hemlock, beech, birch, and maple are the principal woods taken in all the markets. Lack of material is causing many of the shops to run on half time. Fuel market is poor because waste wood is abundant. Timber prices are good and steadily increasing. Competitive bidding brings better net results. Transportation rates are high. There is a small nearby lumber mill belonging to a few farmers. This may be brought into more active operation later on.

Erosion.

Erosion is slight on State land because of the good humus cover and the unbroken crown in many places.

Forest Fires.

Two small fires occurred during 1912, one in May covering 50 acres, the other in July covering 4 acres. The loss in each instance amounted to a total so far as the woody cover was concerned.

755 acres of State land were burned during 1913 in four different fires. Three of these likewise burned upon private land. The private land burned greatly exceeded the area of State land. Brush burning and railroad fires are responsible for most of the cases. Three observatory towers were built during the year.

Trespass.

Bee hunting on State land is about the only violation of the State rules detected. The hunters are extremely hard to find. Bee keepers in the neighborhood are anxious for the extermination of the wild colonies to prevent the spread of foul brood. It is suggested that all wild colonies on State land and elsewhere be destroyed to exterminate the disease and then start over again.

Outing and Recreation.

No permits for camping were issued for this forest in 1912. There was some hunting but no deer were reported killed. Other game consists of pheasants, squirrels black and grey, and rabbits. The chief enemies to the small game are wild cats and foxes.

One deer and 3 bears were taken during 1913. Numerous wild cats, foxes, skunks, minks, weasels, and raccoons were killed. Grouse and small game are abundant.

Trout fishing is good and many were caught during the two seasons. The people of the neighborhood make free use of the State land. The school children gather nuts and the older residents hunt ginseng.

All camp sites in this forest will be numbered from 3801 to 3899 inclusive. Four such sites have thus far been established, named, and posted.

Lightning Report.

So far as known, 1 hemlock tree was struck in the month of June and 1 hard maple in the month of August. Another hemlock was struck and ignited in the month of July.

During 1913, three trees were struck and shattered, two in June and one in July. The species were:

Hemlock stub,	1
Butternut, living,	1
Hard maple, living,	1
	<hr/>
	3

One noticeable fact regarding lightning is that it more frequently strikes the old dead stubs than it does the living green timber.

34. THE SINNEMAHONING FOREST, MEDIX DIVISION.

Forester, James A. Irvin,* Medix Run.

Forester, Charles E. Zerby,† Medix Run.

Forest Ranger, M. N. U. L. Brooks, Driftwood.

Geology.

The division and the adjacent lands, according to their geological characteristics, may be divided into two general groups, separated by a line running from Cole's house on the Driftwood road east to Medix Run headquarters, and thence southwest to the Clearfield county line, along the tops of the hills above Medix Run.

This general division must be made because of the influence of the "Driftwood Anticlinal," the most important anticlinal to be found in the region. The axis of this anticlinal runs from Driftwood to Clearfield in a southwesterly direction. It raised the strata so high in relation to their elevation at the Bennett's Branch of the Sinnemahoning Creek that they were easily the first eroded away, and this erosion has taken away the many characteristic and valuable parts of the lower productive coal measures, as the upper strata are called. However, in three different peaks of the mountains between the anticlinal and Bennett's Branch, these coal measures are capped with Pottsville conglomerate and they remain intact. These three peaks have all been mined, and contain several veins, probably the Alton coal beds.

*Resigned September 30, 1913.

†Appointed September 1, 1913.

One of the peaks belongs to the Commonwealth, and has a four feet vein, situate on Warrant 5333. Its area cannot be over 200 acres. It has a very good roof and if it were not so far from the market, it could be worked profitably. The rest of the forest lies within the region south of the line mentioned, and is covered with sandstone representing the Pocono sandstone group. The Lincoln Farm, belonging to ranger Brooks, having an elevation of about 150 feet above the surrounding plateau of sandstone, has a small cap of shales and clays, with a smut of coal, remains probably of the representatives of Mauch Chunk red shale and the lower productive coal measures. This peak is 310 feet above the surrounding plateau. No other peaks are to be found within this forest. The surface of the reserve has a nearly level, but broadly undulating, topography, with outcrops of conglomerate associating with the Pocono sandstones. The Mauch Chunk shale of this region lies close to the lower Alton coal, and at certain points has a heavy deposition of good fire clay. Openings for fire clay have been made at the towns of Medix Run and Benezette, and one was made in June, 1913, on the land of Clark, Brown, and Hough, lying directly north of State land, at a point in Mud Lick hollow, warrant 5343, one-quarter mile south from the State line. It showed 9 feet of good fire clay. There is some indication that fire clay may be found on warrant 5333, below the Alton coal. This peak here is known as Old Roundtop, and is the highest point in Benezette township, as well as on the Medix division, being 2,330 feet above sea level. The plateau is generally at an elevation of about 2,000 feet and the indications are that nothing but sandstone is to be found for a depth of at least 1,000 feet.

To the north and northwest of the line mentioned as being the dividing line between the two types of localities, the edge of the plateau is cut up into very steep ravines by erosion, the heads of the ravines having outcrops of sandstone and conglomerate, down to an elevation ranging from 1,330 to 1,610, generally where the strata of Mauch Chunk red shale are found. These latter are but 50 feet in depth, and again are associated with fire clay and a streak of coal varying in thickness from 4 inches to 16 inches. The soil is greenish at such places, due to the eroding away of the red shales, which are more susceptible to decoloration than the green shales. Below the Mauch Chunk shale is found the Catskill sandstone, and this continues to appear until the lowest point of the township is reached. No glacial drift occurs anywhere in this region. The valleys have a heavy deposition of shales and clays on the surface, caused by the erosion of the lower productive coal measures, Pocono sandstones, and Mauch Chunk shales. This deposition does not form a gradually sloping talus on the sides of the steep hilly ravines, but thins out rapidly as

one goes up the mountain, making the main valleys very narrow, so far as agriculture is concerned. The region is remarkably well adapted to the growing of timber, as the annual rainfall is reported to be 45 inches. The erosion going on at present is confined to the roads ascending the steep ravines, as the hills and the plateau are covered with an adequate protection of brushy growth.

The Medix Division of this forest lies in both Cameron and Elk counties, 6,500 acres in the former and 18,000 in the latter, a total of 24,500, not yet sub-divided into compartments. The boundary survey has not yet been started. There is no mature or hypermature forest, and only a few large sized trees. Only one area of 200 acres has a density in excess of 50 per cent. 8,000 acres have a density of from 10 per cent. to 50 per cent. covered with hardwood brush. The balance of the forest, 16,500 acres, is covered with brush and fire killed timber. There is no cleared land. Natural regeneration, with protection, is proceeding favorably. More than half the area requires reforestation by planting.

There is but one interior tract, the Lincoln Farm of 173 acres, desirable for observation purposes and the home of a forest ranger.

Springs and Streams.

Springs are made accessible, cleaned, and posted, and usually have camping sites located near them. Springs and camp sites bear the same name. The character of the region is such that the contamination of springs and streams is remote.

Buildings and Repairs.

The buildings consist of an 8-room forester's house near the station at Medix Run and the necessary out-buildings. Six permanent camps are located within the division, three of which are in good condition, while the others are mere sheds. Thirteen miles of telephone line have been built from the forester's office to the Lincoln farm. A 3-mile extension is in progress. At Medix Run he has telephone connection with local lines and to the Bell line at DuBois. Additional poles are needed to take the place of trees and stumps.

Roads.

All the mountain roads are in bad condition, needing ditching and surfacing. Swampy spots are found in those on the plateau. Their use as fire lanes is difficult because of heavy growth of grass. Nine miles of fire lanes and eight miles of road were improved in 1912. Total length of open roads is 18 miles and of trails 14 miles.

In 1913, about 4 miles of roads, trails, and fire lanes were improved. The main road from Medix Run to Driftwood is the basis of all road operations, and passes midway through State land. All other roads lead from it right and left down the hollows.

Minerals.

Coal is reported in the neighborhood but its character is unknown. Its actual existence has not yet been brought to the notice of the forester.

Plantations.

During 1913, 47,200 white pine 1-1 seedlings were planted, covering an area of about 31 acres. This plantation is the beginning of a planting to cover a strip one-fourth of a mile wide and two miles in length along the old railroad grade.

Nurseries.

A small experimental nursery was started in the spring of 1913, using Norway spruce, European larch, and white pine. The white pine failed. There are approximately 30,200 spruce and 14,000 larch in the nursery. There is an abundance of good land for the establishment of a large State nursery and almost any known exposure may be had.

Labor.

Wages range from 16 cents to 25 cents per hour. Boys receive 15 cents per hour. By the day, men ask \$1.75 or \$1.25 with board. Labor is scarce in the whole region. Nearly all available men work at the tannery, where wages prevail from 16 cents to 25 cents per hour. It is not possible to get together more than a dozen men in any emergency. Teams cost \$5.00 per day.

Markets.

No large timber using industries are near at hand. Small market is found locally for mine props, caps, ties, and hemlock bark. Du-Bois, 28 miles, and Pittsburgh, 150 miles distant, are the ultimate outlets for all products in quantity.

Insects and Fungi.

The chestnut blight has not yet appeared in this forest. The fire killed timber is being destroyed by various species of saprophytic fungi. The presence of the white pine weevil has been noted.

Forest Fires.

No fires occurred on the division during 1912. Two fire observatories are needed. A clear vision of ten miles may be had from them. One would be convenient to the present telephone line. But one forest fire occurred on State land during 1913, although that covered an area of 2,000 acres. Two other nearby fires on private lands occurred in April. No definite knowledge of their origin is at hand.

Outing and Recreation.

The location of camp sites is marked on the division map. Deer are abundant and 18 are reported taken during 1912; also five bears. At least 150 hunters camped during the season.

In 1913, two camping parties located within the forest during the year for the fishing privilege. One party brought with it too much liquor and became disorderly. No hunting permits were issued. All hunters came on the State land for a day only. 25 deer were taken, 2 bears were killed, and numerous pheasants and other small game.

Trout fishing was fair; bass and eels are found in the larger streams.

Permanent camp sites within this division will be numbered from 3,101 to 3,199 inclusive. Thus far 37 permanent sites have been located.

Lightning Report.

Four trees were struck and shattered so far as could be noted, during 1913, 1 in September and 3 in October. The species struck were

Chestnut,	2
White pine, (dead),	2
	<hr/>
	4

35. THE SINNEMAHONING FOREST, SINNEMAHONING DIVISION.

Forester, Harry E. Elliott, Sinnemahoning.

Forest Rangers:

R. M. Crum, Sinnemahoning.

L. C. Wykoff, Firstfork.

Joseph Kissell,* Sterling Run.

C. A. Swartz,† Sterling Run.

C. M. Bailey,‡ Sinnemahoning.

The Sinnemahoning division contains about 60,000 acres. The boundary lines of this division are not yet surveyed. Corners and lines are difficult to find. Posting has been done as well as possible under the circumstances. There are a few hypermature trees. Many defective hardwoods exist, which will be removed through improvement cutting. Market conditions are such that all product thus derived may be sold. 10,000 acres have a density of 50 per cent. or more, 3,000 acres are in need of improvement. 7,000 acres will sufficiently stock the land if protected. 30,000 acres have a density of from 10 per cent. to 50 per cent., principally hardwoods. Planting here must be resorted to. 15,000 acres are brush lands. On 5,000 acres there is no regeneration.

Springs and Streams.

Springs are abundant. The principal ones are being made accessible and are kept clean. The flow is regular in most of them. Many become dry during drought. No streams are contaminated except in the main valley, where they receive the refuse from pulp mills, tanneries, coal mines, and dynamite works.

Buildings and Repairs.

A lumber camp and two barns are at the head of Wykoff Run, occupied by Ranger Bailey. New paper roofs were supplied. The lumber is at hand for building new buildings, which are badly needed. A telephone line is in course of construction. When finished it will cover about 9½ miles from the ranger's home to the forester's headquarters at Sinnemahoning.

*Died May 19, 1912.

†Began service July 9, 1912.

‡Began service April 1, 1913.

Roads.

The total length of open road in 1912 was 25 miles; trails 2 miles; fire lanes 41 miles. During the year the forester expended labor on 14 different roads. Improvement consisted principally of ditching and surfacing; also grading, bridging, and mowing of the brush, where needed.

In 1913, about 70 miles of roads, trails, and fire lanes were worked over and improved during the year. Two miles of new trail were constructed.

Plantations.

During 1912, 29,000 seedlings, covering an area of about 11 acres, were planted. They included

- 15,000 White pine.
- 12,000 Norway spruce.
- 2,000 *Pinus ponderosa*.

In 1913, the following plantations were made:

White spruce, 3-year tr.,	2,500
White pine, 3-year tr.,	2,500

To date 28 acres have been planted on the division, using 70,000 seedlings, of which 42,500 are white pine, 12,000 are Norway spruce, 2,500 are white spruce, 2,000 are *Pinus ponderosa*, 3,000 are black cherry, 2,000 are red oak, 6,000 are red ash.

Nurseries.

A small nursery was started in 1911 and in 1912 contained 5,500 1-year old white pine seedlings. Another was begun in 1912. They together show the following inventory:

White pine, 2-year,	5,386
White pine, 1-year,	1,884

One of the nurseries is in charge of Ranger Crum and the other of Ranger Wykoff. The damping-off fungus is prevalent and causes the loss of many seedlings. The results are not yet satisfactory.

Sample Plot.

A small experimental planting was made in a bracken thicket. Until the plot burned over the young pines were making good growth and

would have shaded out the bracken. 2,000 additional *Pinus ponderosa* were later planted for the same purpose. A great many of these were also burned. Spot planting has since been tried but the success of this method is not assured.

Labor.

The cost of labor is from \$1.75 to \$2.00 per day. Teams cost \$4.00 per day. Other industries have come in to take the place of former lumbering. There is an abundance of work to be done, wages are good, but men are scarce.

Improvement Cuttings.

White pine injured by recent fire is being lumbered off by the regular forest force. It will yield probably 50,000 feet.

Markets.

Almost all of the material within the forest is so situated that it is difficult to market. Marketing operations would probably be conducted at a loss. There is much scattered dead timber but it cannot be removed at a profit. Many fire scarred and hollow trees ought to be removed, as they will never make good lumber. All could be spared without increasing danger from erosion. Such material near the railroad can be disposed of at a profit. By competitive bidding, a tract of such damaged timber was sold to Huntley and Bailey at \$3.05 per thousand mill cut. All fire-killed trees, which included white pine, yellow pine, hemlock, and hardwoods, were marked and taken. Nearly a million and a half feet were thus disposed of. On the area whence this was taken, more than a half million feet were left standing.

Erosion.

On the steep hills where fires have burned severely, erosion is becoming apparent.

Forest Fires.

Three fires occurred during 1912, covering an area of 800 acres. In all these fires only the top layer of leaves was burned and no serious damage resulted, not over 10 per cent. of the inferior growth being killed.

In 1913, 3,700 acres of State land were burned over. The fires were particularly severe, probably the most destructive for years. The

drought and great heat made it difficult to extinguish them. Constant patrolling had to be kept up. The railroads make an effort to prevent fires. The Pennsylvania is the more successful of the two.

Outing and Recreation.

Twenty-five temporary camps were located on the division during the hunting season of 1912. Thirty-five deer and ten bears were reported taken and a large quantity of smaller game.

In 1913, forty camps were located within the State Forest during the hunting season, with 373 campers. Probably 500 men hunted upon the State land. All conducted themselves well. Thirty deer and ten bears were taken. Fishing has been good. Twelve fishing camps and sixty-five persons occupying them were out in the spring.

Lightning Report.

The unusual prevalence of severe thunder storms in this region is to be noted.

The forester and his rangers counted 57 trees struck and shattered by lightning during 1912. The period of greatest frequency was during the months of July and August, and the trees struck by species in the order of frequency, are as follows:

Chestnut,	12
White pine,	10
Red oak,	10
Hemlock,	8
Rock oak,	7
Yellow pine,	6
White oak,	4
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	57

Of the above trees, two hemlocks, three pines, one chestnut, and four red oaks were dead. Two dead pines were ignited by the current.

36. THE SINNEMAHONING FOREST, SIZERVILLE DIVISION.

Forester, W. B. Evans, Sizerville.

The forester on this division took charge September 1, 1912, prior to which time this area was attached to the division under Forester Elliott. It divides naturally into western, eastern, and southern subdivisions, lying both in Cameron and Potter counties, and contains about 20,000 acres. The tract was recently lumbered and consequently has no virgin or mature forest. Repeated fires following the lumbering have burned the slash and retarded young growth.

In general the rock formation of the district dips to the northeast with a slight local dip to the region immediately surrounding Sizerville. Grey and light brown soils from shales and sandstones of the Chemung and Catskill groups are exposed in the valleys and on the lower slopes; grey and red soils from shales and sandstones of the Pocono and Mauch Chunk groups, on the higher slopes; and a conglomerate, evidently the Olean, on some of the hill tops. On a few of the higher summits of the southern portion particularly, the Lower Productive coal measures are present, but probably not in merchantable quantities. Although the division lies very close to the southern limit of the area of glacial deposit it is thought that none of the soil here is of that origin. This belief is based on the general character of the soils, the lack of large rounded boulders usually present in a moraine district, and on a soil map issued by the U. S. Bureau of Soils.

The region may be spoken of as a great plateau, sloping to the south and varying in height from 1,600 to 2,300 feet above tide. The action of water has carved out many deep narrow valleys in this highland until now about 75 per cent. of the whole can be classified as hilly and broken. The remainder retains the plateau appearance. Tributaries of portage and North Creeks drain the eastern and western portions and Hunt's Run the southern portion. All drainage reaches Sinnemahoning Creek and finally the Susquehanna.

Local climate does not differ materially from that of other parts of the State having the same latitude. Long, cold winters with frequent breaks are the rule, with plenty of rain throughout the year except for occasional short periods. Old residents say that these dry spells most frequently come in late spring or early summer and it seems to hold true. In nearly a year and a half May has been the only month in which there was serious danger to forest property from fire. The growing season being scarcely started at this time,

the lack of foliage and herbaceous growth leaves nothing to hinder the progress of fire when once started.

The boundary survey has been partially made and some brushing out has been done. Corners are well marked. About 1,000 acres have a density in desirable species of more than 50 per cent. From 3,000 to 5,000 are above 20 per cent. The remainder will run about 5 per cent. The hardwoods are coming in well, but conifers are scarce. To maintain a proper balance planting with the evergreens must be largely the work of the future. An abundance of dead material suitable for fuel is scattered over the land. Prices are such that it cannot be profitably harvested. In one locality 200,000 board feet of fire-killed saw timber might be procured and should be removed to prevent waste.

Springs and Streams.

All the year round springs are numerous, at least 20 have been cleaned and made accessible. They are subject to variation, but none ceases to flow. All springs and streams are free from danger of contamination.

Buildings and Repairs.

The lumbermen left a number of old shacks on the tract and they have little value. What is known as the Mackay cabin in East Cowley Run, is the best of them, but none of them is worth repairing. The lines of the Bell Telephone Company afford good telephone connection. The free wire between Sizerville and Emporium is of local value.

Roads.

During the short time in 1912 that the forester was in charge, he opened and improved a fire lane of nearly 4,000 feet to a width of 15 feet. The other roads of the region are in need of the usual repairs.

The principal road work during 1913 was that devoted to trails and fire lines, a total of 28.5 miles. About 8 miles only of this distance were regular driving roads.

Minerals.

A deposit of coal is located in a small portion of State lands, but it is not opened or explored. Its extent is not fully known.

Labor.

Labor is scarce and wages high. From 17½ to 20 cents an hour is paid for men, and from \$4.00 to \$5.00 per day for team and driver. A

number of families have moved from the region and the labor problem in the future will probably be more troublesome than at present. The class of labor is good and may be relied upon.

Plantations.

The planted area in 1912 totaled 28 acres, using 68,600 seedlings, 63,600 white pine, 3,000 American elm, and 2,000 honey locust. This small plantation is located on the Bennett tract on the head of East Cowley Run.

During the year 1913 the following species have been planted:

Red pine,	2,000
White pine,	80,000
Scotch pine,	20,000
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	102,000

To date about 128 acres have been planted with seedling trees. All species thus far used are as follows:

White pine,	143,600
Scotch pine,	20,000
American elm,	3,000
Red pine,	2,000
Honey locust,	2,000
	<hr/>
	170,600

Markets.

Since the residents burn wood exclusively, the principal market is for fuel. Maple and other hardwoods cut clean and seasoned are in greatest demand. Standing dead material is worth only from 10 cents to 15 cents per cord stumpage. The transportation facilities are good but rates are high and fuel can scarcely be shipped with profit.

Erosion.

The soil and sub-soil are of porous nature so that the frequent fires have not caused much erosion, because vegetation makes a quick return.

Insects and Fungi.

The white pine weevil is present and its work is noticed in scattered trees. Oyster shell scale infests the young poplars. So far as known, the chestnut bark disease has not appeared.

Forest Fires.

The division has had since the lumbering days, a number of very severe fires. A sentiment against forest fires is developing. The residents respond willingly to the call for extinguishing fire. During 1912 no fires occurred upon it. In 1913, three fires burned on the State lands covering an area of 775 acres.

Outing and Recreation.

There are few regularly established camp sites on the division, although some of the old lumber camps are usable for this purpose. Small game is abundant. Four deer and six bears were reported killed on or near State land during 1912.

Grouse and other small game were abundant in 1913. Three deer and five bears were taken on or near State land. Trout are abundant. Brown trout are frequently caught. Streams are stocked from time to time. Visitors and school children are frequently upon State land. The children of the local school take their outings within the State Forest.

All camping sites within this forest will be numbered from 4,001 to 4,099 inclusive.

Lightning Report.

A few of the dry stubs, mainly chestnut, standing here and there over the forest, were struck during the year. No harm was done to live trees.

37. THE SOUTH MOUNTAIN FOREST, CALEDONIA DIVISION.

Forester, Robert G. Conklin, Fayetteville, R. D. No. 1.

Forest Rangers:

Joseph O. Boggs,* Fayetteville.

James E. Carbaugh, Fayetteville.

B. F. Hassler, Fayetteville.

C. B. Larue,† Orrtanna, R. D. No. 1.

Harry B. Perry, Fayetteville.

Henry L. Stull, Fayetteville.

Wm. G. Taylor, Fayetteville.

F. X. Drachbar, Orrtanna, R. D. No. 2.

James Winters,‡ Shippensburg.

Six regularly employed laborers.§

The Caledonia Division of this forest comprises approximately 26,780 acres, in Franklin, Cumberland, and Adams counties. It is accessible over the Cumberland Valley Railroad to Chambersburg and by means of Chambersburg and Gettysburg turnpike. This road divides the forest into two main sub-divisions, the northern and southern, and these again have been divided into the Cumberland, Conococheague, Big Flat, Piney Mountain, and Rocky Mountain compartments on the northern sub-division, and the Green Ridge compartment on the southern portion. Two small areas, that of about 50 acres surrounding the Graeffenburg Inn and the forester's headquarters, and another of 433 acres comprising Caledonia Park, are not attached to any of the foregoing compartments.

The exterior boundary of this division has been surveyed, painted, and posted. It needs re-running and the better marking of permanent corners. The interior tracts are few in number and unimportant. The Shippensburg Water Company has a small tract in the Cumberland compartment and the Orrstown Hunting Club another in the same neighborhood. This latter tract contains many of the springs which feed Stillhouse Run, and for this reason it is desirable that the Commonwealth possess it at some future time. The other interior tracts are the Kiner and Kean, the Gardner, which are surrounded by State land, and the Irvin tract on the eastern boundary. Timber

*Resigned September 30, 1913.

†Resigned March 31, 1913.

‡Resigned September 30, 1913.

§Charles Leonard, Albert H. Reed, James W. McElwee, Chas. H. Perry, James E. Yeager, and John H. Shoemaker.

is being taken from the latter tract and there is a possibility of future purchase; also the purchase of small indentations along the line would straighten the boundary and simplify systems of road building, fire protection, and forest management.

The mature forest within the division comprises about 500 acres and is almost entirely included in Caledonia Park. That portion having a density of 50 per cent. covers about 12,000 acres, of which 8,000 are at present not in need of improvement, and 4,000 acres are at present in need of thinning and better regulation. The area of scattered tree growth is about 8,500 acres, and the brush land 4,720 acres. Much of the latter shows no natural reproduction. The area of unused open ground does not exceed 50 acres. About 50 acres of cleared land is used for farming purposes. On the rocky land comprising about 800 acres, there is a small scattered growth and no regeneration. The area covered by water is about 60 acres; roads and trails 80 acres. There are 40.6 miles of 14-foot roads on this division. The area in fire lanes and boundary lines is 70.8 acres. There are 41.5 miles of 10-foot boundary line, and 14.1 miles of 12-foot fire lines. About one-third of the whole division area could be planted at present to seedling trees and the remaining third may be planted just as soon as a better road system will make it more accessible.

Springs and Streams.

Springs are steady in flow, lessened during the dry months. Nearly all are used by residents of the neighborhood or by hunting camps. The people using them have cleaned them out and kept them walled up. Streams become low during the hot months; scarcely any go entirely dry. Almost no contamination exists on the northern subdivision. The streams draining the southern portion, Rocky Run and Carbaugh Run, have their heads in the vicinity of the South Mountain settlement for tuberculous patients. The water from these streams is not recommended for personal use.

Buildings and Repairs.

The buildings on the division are the house occupied by the forester at Caledonia, the Graeffenburg Inn and its necessary out-buildings, the Thaddeus Stevens office building, and the ranger's house on the Big Flat. All are good except the Stevens office building, in Caledonia Park, which is now the residence of one of the rangers.

Graeffenburg Inn was remodeled and repaired, as reported elsewhere. The Big Flat house was also repaired. Fences are in good condition except those about the Inn. During the year 15 miles of metallic telephone line were built. There are 6 complete house sta-

tions, one lookout station, 3 test stations. This system connects with the Mont Alto system and later will be connected with the Pine Grove system. Other loops are needed, and then the whole connected with the Bell or Independent lines. The system has proved its great worth thus far in reporting fires.

Roads.

Thirty-one and eight-tenths miles of roads were repaired in 1913, covering all important roads on the division. Road work was continued throughout the season.

Easements.

There are four subsisting easements on the Caledonia division. The pine line and the accompanying telegraph line of the Southern Pipe Line Company cross the southeastern corner. This right of way is an advantage to the forest, for it makes a suitable fire line. The trunk line of the American Telegraph and Telephone Company crosses the northwestern end, and likewise acts as a good fire line. The line of the Cumberland Valley Telephone Company crosses the forest on the right of way of the Chambersburg and Gettysburg pike. It is of much convenience for outside communication. The right of way of the Chambersburg and Gettysburg Electric Railway Company extends from the western boundary to Caledonia Park, a distance of about a mile. The bed of the old steam railroad is used for a portion of the way and the pike for the remainder.

Leases.

There are at present two outstanding leases, the first that of the right to use Caledonia Park to the Chambersburg & Gettysburg Electric Railway Company, a tract of 443 acres, for which the company pays an annual rental of \$100.00. This area is a natural park and should never be used for anything else. It is in no wise detrimental to the conduct of forest operations. The second lease is that to the Borough of Chambersburg for the purpose of taking water for municipal purposes out of Conococheague Creek one mile above Caledonia Park, and carries the necessary right of way for the pipe line and intake dam to the western boundary of the forest. From this lease the State derives annually one-fourth of one per cent. of gross receipts of all water rentals paid in the borough.

Minerals.

There are found throughout the forest, beds of what is called "coal short" ore, but at present it has little value.

Plantations.

Plantings on the division in 1912 were limited to three experimental plots and filling in some blanks on the 1906 and 1907 plantations. Each experimental planting covered one acre, and the remaining work was re-inforcement of 8 acres of prior plantings, requiring 250 transplanted white pines worth \$4.00 per thousand. The plantation area this year totaled about 46 acres, $3\frac{1}{2}$ acres of which have been set with 9,000 Carolina poplars, which failed, and then with 4,000 willow cuttings.

The planting in 1913 consisted of reinforcement, extension, and experiments in under-planting scrub oak. Plantings for the year were as follows:

Norway spruce seed, 2 pounds; transplants, 2-year,...	9,050
Norway spruce, transplants, 3-year,	700
White pine seed, 6 pounds; transplants, 2-year,	6,800
Scotch pine, transplants, 2-year,	800
Scotch pine, transplants, 4-year,	1,380
European larch seed, 1 pound; 3-year,	5,750
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Total transplants,	24,480
Total seed, 9 pounds.	

To date there have been planted with seedlings 63.54 acres of open ground. In this work the following seedlings were used:

White pine, white ash, and black walnut mixed,	75,000
White pine, pure,	42,793
Norway spruce,	9,750
Scotch pine,	7,900
White ash, pure,	12,620
Poplar cuttings,	9,000
Willow cuttings,	4,000
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Total,	161,063

In reinforcement work, strengthening of 24 acres of older plantations, the following were used:

White pine,	2,700
Scotch pine,	1,650
White ash,	175
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Total of all planting,	165,588

Nursery.

The Caledonia nursery, established in the spring of 1908, contained then 4,200 square feet of bed surface. In 1912 it was enlarged to 17,504 feet of bed surface. The inventory taken in November, this year, shows a growing stock of:

White pine,	63,039
Scotch pine,	20,167
Norway spruce,	31,993
Red pine,	8,482
European larch,	1,147
Douglas fir,	5,540
White ash,	2,080
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Total,	132,448

Of the above seedlings, 52,059 were available for planting in the spring of 1913. During 1912, seedlings to the number of 1,050 were furnished to private individuals, 200 were furnished to Forest Ranger Sundy for planting in the Henry Valley, and 6,625 planted on this division. $7\frac{1}{2}$ pounds of seed were planted in the nursery beds, the species being Scotch pine, red pine, Norway spruce, white pine, Douglas fir, and European larch. This small nursery is not classed with the larger nurseries conducted by the Department, nor is it intended to be. It is used principally as a demonstration nursery and is visited by hundreds of people every year. The soil is not the best, but the best that can be had.

The inventory at the end of 1913 shows the following stock:

White pine, 1-1 year,	17,423
White pine, 1-year,	4,622
Norway spruce, 1-1 year,	676
Norway spruce 1-year,	2,707
Scotch pine, 1-1 year,	17,954
Red pine, 1-1 year,	1,225
Douglas fir, 1-1 year,	724
European larch, 1-year,	550
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	45,881

A heavy loss of seedlings occurred during the spring. The whole force was called away to a fire and the seedlings were neglected dur-

ing transplanting. The following shipments were made in the spring of 1913:

White pine, 3-year,	60	Forestry Exhibit.
White pine, 4-year,	50	I. C. Williams.
White pine, 3-year,	17,000	N. R. McNaughton.
Norway spruce, 3-year, . .	8,000	N. R. McNaughton.
White pine, 2-year,	3,000	Dr. Carey.
Scotch pine, 2-year,	100	Dr. Carey.
Norway spruce, 3-year, . .	500	Dr. Carey.
European larch, 2-year, . .	500	Dr. Carey.
White ash, 1-year,	500	Dr. Carey.
White pine, 4-year,	25	S. S. Wylie.
Scotch pine, 2-year,	25	S. S. Wylie.
Norway spruce, 3-year, . .	25	S. S. Wylie.
White ash, 1-year,	25	S. S. Wylie.
White pine, 4-year,	200	H. K. Deisher.
Scotch pine, 2-year,	100	H. K. Deisher.
Norway spruce, 3-year, . .	100	H. K. Deisher.
White ash, 1-year,	200	H. K. Deisher.
White pine, 4-year,	1,000	Leonard Rhone.
Norway spruce, 3-year, . .	1,000	Leonard Rhone.
White pine, 3-year,	3,000	C. G. Derr.
Norway spruce, 3-year, . .	500	C. R. Pendleton, Jr.
White pine, 5-year,	2	Mrs. Ida L. Gibbs.
White pine, 5-year,	3	W. H. Ennis.

Labor.

Labor in this region is worth 16 cents per hour. Three men were on the regular pay roll in 1912 at a fixed wage per month. Two-horse teams cost 35 cents per hour, four-horse teams 50 cents per hour, carts 25 cents per hour. With teams the driver is supplied. Workmen are scarce. The shops at Chambersburg and elsewhere in the Cumberland Valley give more steady employment.

In 1913, the regularly employed laborers were six in number and each received \$35.00 per month. For time lost beyond the allowance they must make refunds. The wage rate is too small but as large as finances will permit. Labor is scarce and of low efficiency.

Improvement Cutting.

The 1912 improvement cuttings on this division were a continuation of that undertaken in 1911. The Conococheague improvement was continued. Young hemlock, with increased light and air, have been especially benefitted.

Markets.

The local markets are supplied principally by farmers and small owners with portable mills. They are cutting their own timber rapidly and selling it at prices often below the ruling market price. At present this division has no products for sale. Transportation facilities are good with railroad station five miles away.

Erosion.

Because of the good forest cover, erosion on this division is a matter of no consequence.

Insects and Fungi.

The pine weevil is causing some damage to young pine plantations by attacking the leaders. As they are detected the shoots are cut off and burned. The chestnut blight fungus is active and its ravages are very evident.

Forest Fires.

The force of forest fire fighters is efficient but communication is difficult and loss of time results in reaching a fire. Sometimes the uncertainty of location is responsible for this loss. When the protective system, including telephones, towers, good roads, and complete maps, is finished, the fire problem will be less difficult.

The year 1913 was one of the worst years for forest fires. Many are believed to have been of incendiary origin. 12 different fires were reported during the year either on or near State land. The area of State land burned is 1,877 acres. During this year protection cost the high rate of \$0.0778 per acre.

Outing and Recreation.

Ten temporary camps were erected in the division during 1912. These included 86 campers. All were hunters. Nearly all took good care of their camp sites but a few left quantities of rubbish. One party, after warning, returned and cleaned up the camp site. Hunting is good in this region. During this season 75 bucks were reported killed. There were also a few does. Pheasants were scarce; other small game abundant. Trout fishing is hardly fair. Too many men for the number of fish. Annual stocking does not seem to keep up the sport.

All camp sites will be numbered from 4,101 to 4,199 inclusive.

In 1913, 14 camps were located in this forest, occupied by 110 people. 13 were hunting camps. One set of campers offended by reason of the unsanitary condition in which they kept their camp and the surroundings. Game was abundant. 75 bucks and 8 does were killed during the open season. Fishing is not the best. The streams are stocked, but over-fished.

38. THE SOUTH MOUNTAIN FOREST, MONT ALTO DIVISION.

Forester, Lewis E. Staley, Mont Alto.

Forest Rangers:

David Knepper, Mont Alto.

John Bricker, Mont Alto.

John Shaffer, Mont Alto.

Harry L. Thomas, Mont Alto.

Harry W. Staley, Mont Alto.

D. C. Bittinger, Mont Alto.

John L. Carbaugh, Mont Alto.

James Martin, Mont Alto.

Edward Carbaugh, Mont Alto.

Maurice Baker, Mont Alto.

G. W. Patterson, Mont Alto.

Harry McCrea, Mont Alto.

The Mont Alto Division has been duly reported upon topographically in former reports, Roughly it is divided into four ranges. It has the nature of a wide rolling plateau, cut by streams, leaving knobs and hills. The climate is mild. The winters are not severe. The approximate area of the division is 20,000 acres, divided among four of the regular rangers, 5,000 acres to a man for general patrol purposes. The other rangers are engaged in general work anywhere within the forest. The boundary lines of this forest have all been surveyed. For half the distance they are brushed 10 feet wide. All lines, corners, and stakes are painted every two years, when corners are rebuilt. Several small added tracts are not yet included. The lines were all repainted during 1912. There are a number of small interior tracts, some of which may possibly be acquired in the future. At present they are held at prohibitive prices.

There are no mature forests on the division. 250 acres contain mature and hypermature trees, making about 60 per cent. of the total stand. The improved area is 525 acres, 25 having been added during 1913. 9,000 acres are in need of improvement within the coming years. Improvement work yields from 3 to 10 cords per acre, valuable principally for fuel, acid wood, or charcoal. Normal density of certain of our tracts is best promoted by clear cutting because of the former frequent fires. The appearance of the chestnut bark disease has caused private owners to market their chestnut. About 5,000 acres have a density of from 10 per cent. to 50 per cent. About 4,000 acres of this forest are covered with scrub oak and brush. The humus and soil have been burned. One-fourth of the area must be reforested and at a high cost, because of difficulty in planting. 30 acres of old fields remain unplanted; 50 acres are covered with rocks where no cutting should be done and where planting is greatly restricted; roads occupy 114 acres, fire lanes 8 acres, and boundary lines 12 acres.

Springs and Streams.

All of the 9 good springs within this forest, with the exception of two, flow continuously. There are 4 main streams in the tract. They are the West Branch and the East Branch of the Little Antietam, the Carbaugh, and the Rocky Mountain runs. Little contamination is possible. The Mont Alto Sanatorium is located at the head of Rocky Mountain Run. Because of this fact, the water of Rocky Mountain Run is not recommended for personal use.

Buildings and Repairs.

There are 6 buildings at present occupied and used for forest purposes, all but one being located at the old furnace site. Some of these are in need of repair and others would better be torn down and rebuilt. The public telephone lines cross this forest and both are connected with forester's headquarters. $13\frac{1}{2}$ miles of private telephone line were built during 1912. 6 miles of it is attached to the poles of the Southern Pipe Line Company and the remainder was built by the forester at a cost of \$46.85 per mile. The cost varies according to local conditions. The value of the telephone and fire tower system has already been made apparent. Of the 6 fires, none but one burned over more than 10 acres, and all were reported so quickly that they were immediately attacked and extinguished before much damage was done. Two of the rangers carry portable telephones with tapping-in stations at suitable points. With the tower system completed, the ranger with his portable phone will be on or near his tower constantly

during fire season and it is hoped to control fires almost completely. The labor of building the $13\frac{1}{2}$ miles of line above reported was practically all supplied by the forester and his rangers. There are now one main fire tower and 6 temporary lookout stations. The main tower is 40 feet high built of squared lumber.

Roads.

At the close of the year 1912, the total number of miles of road open within this forest was 59; trails $\frac{3}{4}$ of a mile; fire lanes 8 miles; boundary lines $7\frac{1}{2}$ miles. Roads, trails and fire lanes for a distance of 58.3 miles were repaired in 1913. The work consisted of grading, ditching, surfacing and bridging.

Easements.

A private tramway runs from the English Siding to the private sand banks of Gregg, Forney, Smith & Middlekauff. From sand shipments the State is in receipt of toll charges of 75 cents per car. The Waynesboro Water Company has a right of way over State land at the Old Forge. The lease of the Cumberland Valley Railroad Company for Mont Alto park has expired and will not be renewed. The park buildings are to be taken down. Others are the rights of way of the Southern Pipe Line Company and the Pure Oil Pipe Line Company, with their accompanying lines of telegraph.

Sample Plots.

A 3-acre plantation was made on Stony Mountain in 1910. The object was to study the reforesting of scrub oak lands.

Plantations.

Approximately 250 acres have been planted to seedlings to date, one acre with tree seeds, and one acre with cuttings. The total plantings are 585,124 seedling trees and 3,000 cuttings. Of the above, 461,400 were white pine and the balance Norway spruce, Scotch pine, black walnut, honey locust, European larch, eastern catalpa, balsam fir, *Pinus ponderosa*, persimmon, western catalpa, hickory, ash, oak, and locust.

During the year 1913 the following plantings were made:

White pine,	47,800
White ash,	3,000
Black walnut,	5,800
Red oak,	1,440
White oak,	490
	<hr/>
	58,530

Thirty thousand of the above white pine were planted under scrub oak. The oak were planted into open places.

Labor.

Laborers are in demand and hard to get. 16½ cents per hour is the price in the neighborhood of the sanatorium. Steady men have continuous employment at Waynesboro. The long walks to the work on the reserve are not inviting. For forest work the State pays 15 cents per hour, or \$35.00 a month for regular employment. Elsewhere in the region labor costs 16 cents per hour with pay for walking to and from work.

Improvement Cuttings.

During 1912, 25 acres were improved, the cover being mainly chestnut. Some oak and maple were also taken out. The dead wood is being rapidly removed from all parts of the forest. Improvement cuttings of previous years are showing excellent results. The crown is closing and conditions are favorable to the production of the ideal stand.

Markets.

The market for the forest product is limited. An effort is made not to interfere with private holders of woodland. The forest supplies the fuel market in the immediate neighborhood. There is a good demand for building lumber, chestnut shingles, railroad ties, and chestnut plastering lath. No call for rails and posts. Prices at the mill are as follows:

Building material, \$18 to \$22 per thousand feet.

Chestnut shingles, \$4.50 to \$5.00 per thousand.

Chestnut plastering lath, \$4.00 per thousand.

Locust posts sawed, 20 cents to 25 cents each.

Cord wood, \$1.50 to \$2.10 per cord.

The haulage is from .1 to 9 miles by team. Then transportation facilities are good. The Western Maryland is near the southern boundary. Railroad rates to Chambersburg, 15 miles, are as follows:

Sawed material, 40c.

Charcoal in carload lots, \$1.20.

Cord wood, including pulp wood, 35c.

To other points the rates vary in proportion to the distance.

About 650 cords of miscellaneous wood were removed in 1912 during the process of improvement and cleaning up the dead wood.

During 1913, 757 cords of dead fire wood and 68 cords of green fire wood were sold.

Insects and Fungi.

The chestnut blight has appeared generally within this forest, and threatens all the chestnut on the division. The infected areas vary in size from one tree to 7 acres. As soon as detected, all defective trees are cut, stumps peeled, and the material burned. Occasionally the disease is found on sprouts. A number of areas belonging to private owners are likewise infected.

The white pine weevil has attacked nearly all the plantations but thus far has done no serious damage. Its attack is followed up closely and all infected shoots cut and burned.

Forest Fires.

During 1912, forest fires were confined mainly to the hunting season. It is believed that at least 50 per cent. of them were caused by carelessness rather than intentional firing. A 40-foot fire tower of good character was built on the Knob. It was constructed of white pine, locust, and oak. The actual cost of the material was \$45.38. The labor supplied by the forester and his rangers at the usual rates amounted to \$35.84, making the total cost of the tower \$81.22. It is substantial, serviceable, and of great value in case of fire.

The total area burned within this forest by fires during the year amounts to 250 acres. In two of the fires the loss was complete or nearly so, while in the others it was slight.

During 1913, there seemed to be a systematic plot to burn out this forest. Fires of an incendiary origin were constantly occurring. 16 fires were had during the year. It is stated that passage of the hunters' license law is responsible for most of them. The burned area of State land was about 1,300 acres and in many cases the losses were severe.

Trespass.

Compared to former years, trespassing has very greatly decreased. An occasional removal of wood without permission is detected. Usually these cases are settled by paying the cost of the material taken rather than by criminal prosecution. We find it promotes better relations among those who are tempted to do acts of this kind, and fairness and leniency seem to prevent repetitions just as readily.

Outing and Recreation.

A number of hunting camps surround the State Forest, but during 1912 only one was located within it. Eight bucks were reported killed and two does. Birds are scarce; other small game rather common.

In 1913 only one hunter's camp was located within the State Forest. The others were on interior tracts. 28 deer were killed and small game in abundance. Trout were plentiful but since the streams are small, all were easily caught.

Lightning Report.

All damage from lightning occurred during the month of August. Seven bolts in all are known.

Oak,	4
Chestnut,	2
A lot of chestnut coppice,	1
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	7

39. THE STUART FOREST.

Forester, John R. Williams,* Ligonier.

Forester, John L. MacAvoy,† Ligonier.

Forester, V. M. Bearer,‡ Ligonier.

Forest Rangers:

Wilson R. Barndt, Somerset, R. D. No. 3.

Oran Snyder,§ Rector.

The boundary survey is completed, lines painted, and trails brushed.

The Stuart Forest has only recently been subjected to development. It comprises about 8,500 acres, lying on the Laurel Ridge in both Westmoreland and Somerset counties. It is a region of great promise and a suitable enlargement of the present area would make it one of the most valued and best appreciated State Forests, being in a region where there is no other State holding for similar purposes.

On September 1, 1913, V. M. Bearer succeeded John L. MacAvoy as forester, and his report for the remaining four months is supplemental to Mr. MacAvoy's.

Of the Stuart State Forest, only about 190 acres is of a mature and hypermature timber, much of which is depreciating and should be re-

*Transferred to South Mountain Forest, April 1, 1913.

†Resigned September 30, 1913.

‡Appointed September 1, 1913.

§Resigned September 30, 1913.

moved at once. Estimates are being taken on quantities varying from 500,000 to 750,000 board feet.

Springs and Streams.

Twelve springs have been cleaned and made accessible. During the season of drought Lynn Run has no water. The water sinks and flows underneath the bed of the stream for a distance of two miles.

Buildings and Repairs.

There are no buildings on this tract except a small cabin at Laurel Summit on the top of the mountain, forming a convenient station for the forester. This cabin was repaired during the summer by being supplied with a new shingle roof. It is now in good condition and contains full equipment.

The telephone attached to the railroad line is near to this camp.

Roads.

The development of the road system is not well advanced. The new roads to be built will largely follow the old wood roads where the grades are suitable. In other places they will be relocated. The total road mileage within the present forest is 18 miles; trails $\frac{1}{2}$ mile; fire lanes, 13 miles; boundary lines, 8 miles.

Easements.

The only easement in this forest is the right of way of the Pittsburgh, Westmoreland, and Somerset Railroad Company.

Leases.

There is one outstanding lease in this forest held by Thomas H. Cronin Company, of Pittsburgh, for the removal of blue stone from a quarry along Laurel Ridge. It yields a royalty of 16 cents per ton. The quarry is of small size but produces stone of good quality and in large quantity. This lease is reported on elsewhere.

Minerals.

A small vein of coal underlies practically the whole area. It probably does not exceed four feet anywhere, and no doubt is thinner in

places. The vein is undeveloped because the coal cannot be removed at a profit. As a store against future demands, this coal may at some distant date be a valuable asset.

Plantations.

A small amount of planting was made during the 1912 season, using 10,000 2-year-old seedlings, 8,000 of which were Norway spruce and 2,000 *Pinus ponderosa*. 5,000 of them were placed on a 2-acre plot known as the dynamite experiment plot, 3,000 on an acre and a half at Laurel Summit, and the 2,000 *Pinus ponderosa* on a similar area at the Marker Mill plantation.

In the Laurel Summit 1913 plantation of 28 acres, 50,000 transplanted 3-year-old white pine seedlings were used.

The total plantings to date within this forest are 75,500, 65,500 of which are white pine. The total area planted with seedlings to date is $39\frac{1}{2}$ acres.

Labor.

Wages are at a minimum of \$2.00 per day. Team with driver costs from \$4.50 to \$6.00 per day.

Forest Fires.

During 1912 about 75 acres of State land were burned over. Two additional fires occurred on nearby private land, the extinguishment of which was aided by the forest force. One fire was believed to be of incendiary origin, while the others apparently originated from the railroad.

In 1913 5 forest fires burned upon State land, covering an area of 1,020 acres. In most instances the fires were light and the damage slight. One 50-foot fire tower has been located.

Outing and Recreation.

Little camping occurred during 1913 because of the rule prohibiting camps within one-half mile of a game preserve. The Stuart Forest is now within the excluded region for deer hunting. Pheasants were abundant. Squirrels and rabbits also abound. Little other game is found. Other wild animals such as raccoons, skunks, weasels, minks, and foxes, are trapped.

Lightning Report.

Fourteen trees were struck and shattered during 1912, the first in April and the last in November. Fires were started in two of the chestnuts struck. The species are:

Chestnut,	7
White oak,	2
Red oak,	2
Carolina poplar,	2
Tulip poplar,	1
	<hr/>
	14

During 1913, 4 lightning bolts are known to have struck within this forest, one in July and three in August. Two were in red oak and two in chestnut.

40. THE STONE FOREST, ASAPH DIVISION.

Forester, Paul H. Mulford, Asaph.

Forest Rangers:

Henry C. Cox, Wellsboro.

E. N. Jenckes, Asaph.

The Stone Forest lies within Tioga county, and includes within its boundary the Asaph forest nursery. The boundary survey is complete with the exception of two of the recently purchased lots.

In 1913, 29 miles of the boundary line were brushed and posted during the year, 26 miles remarked and 100 corners were rebuilt. On October 1, 1913, the Chatham division was re-attached to Asaph.

The Stone Forest is practically solid, there being almost no interior tracts. A few exterior tracts would be valuable to straighten the boundary lines. The forest at this time comprises over 50,000 acres, a portion of which is under the charge of the foresters located at Blackwells and at Middlebury Centre. The whole area has been completely lumbered, and succeeding forest fires have burned severely. At least 1,200 acres of open ground thus cleared by the fires is available for planting.

There is no virgin forest on this division. Probably 1,000 acres will contain mature or hypermature trees, and 3,000,000 feet could be removed at present. The prevailing species are white, red, yellow, and pitch pine; hemlock, maple, chestnut, beech, and oak. A 50 per cent. density or greater may be found on about 500 acres. It needs no present improvement. 480 acres carry a density of from 10 per cent. to 50 per cent. Brush and weed growth cover 4,500 acres. 2,200 acres are classified as burned-over area. 54 acres are used for roads and 91 for trails; fire lanes occupy 21 acres. The balance of the division is covered with a scattered brush and weed growth.

Springs and Streams.

There are no lakes, dams, or ponds within the tract. The streams and the general water supply of the region were fully described in the last report. Springs generally are clean and accessible and their location posted. Their position is indicated on the working maps. At least 90 per cent. of them flow steadily. The remainder are dry during the hot months. The severe fires with loss of humus are undoubtedly responsible for the failure of some of them. The streams have great volume of water during the spring and autumn, but during mid-season become low. Some of them run underground for a part of the summer. The restoration of the forest cover will assist the stream flow. There is little or no contamination of the waters within this forest.

Buildings and Repairs.

The buildings consist of a number of lumber camps and old shanties, most of them in poor condition and in need of repairs. At present they serve as rough shelters during inclement weather. Five small storm shelters have been built at various places. A line of the Bell Telephone system is near the forest and party lines are numerous, costing \$18.00 for residence and \$24.00 for business telephones per year. The toll line radius is Wellsboro and Leetonia. The building of the State Forest line has been begun.

Roads.

The total road mileage within this forest at present is 38; trails 5½ miles; fire lanes, 11 miles; boundary lines, 30 miles. During the year these were brushed out and improved. In 1913, 27.3 miles of roads, trails, and fire lines have been improved. The map of the road system has not yet been completed.

Easements.

A number of individuals enjoy the privilege of passing over portions of the State land. This is not objectionable and assists in protective work.

Seed Collection.

The seeds collected in 1912 were used in the Asaph nursery, and were as follows:

Slippery elm, 31½ pounds, costing 16 cents per lb. to gather; black cherry, 315½ pounds, a portion of it costing 2½ cents per pound and the remainder 6 1-5 cents per pound.

All seed was of good quality, but few trees with fertile seed were found.

Seeds for use in the local Asaph nursery are regularly collected. In 1913, 1,260 pounds of red oak of fair quality were gathered. The collection was at the rate of about 3½ cents per pound. By reason of the short season and late frosts, development of seeds was poor.

Plantations.

Plantations to the extent of 40.88 acres were made during 1912, using the following seedlings:

White pine,	50,700
Norway spruce,	6,470
European larch,	5,875
White ash,	2,474
Red oak,	650
White oak,	250
Honey locust,	750
Black cherry,	107
Sugar maple,	470
Elm,	7,150
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Total,	74,896

Planting during the year 1913 amounted to 51,088 and comprised the following species:

Norway spruce, 2-year,	21,800
White pine, 2-year,	22,000
Scotch pine, 2-year,	4,100
Silver pine, 3-year,	3,188
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Total,	51,088

All seed was planted in the Asaph nursery, using 1,620 pounds of various kinds.

To date 153.88 acres have been planted with seeds and seedlings, 12.25 acres being set to seed, using white pine, chestnut, and black walnut. Planting to date on this division is as follows:

European larch,	8,577
White pine,	147,800
Bull pine,	1,000
Norway spruce,	30,770
Scotch pine,	38,430
Balsam fir,	600
Silver pine,	3,188
Red oak,	9,841
Honey locust,	6,250
Chestnut,	900
Black cherry,	11,807
Black walnut,	90
Sugar maple,	1,770
White oak,	250
White ash,	26,026
Elm,	13,574
Hickory,	605
Persimmon,	492
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Total,	301,970

Nurseries.

(See report under "State Forest Nurseries").

Labor.

Labor in this region costs 18 cents per hour and 35 cents per hour for a man and team. There is much work but few men to do it. The quality of the labor is good. Any local and New York state demand decreases the number of available workmen for forest work.

Markets.

Pine, hemlock, and hardwoods, all sizes and lengths, are worth from \$3.00 to \$10.00 per thousand feet. Fence posts of chestnut and oak 6½ to 7 feet long, 4 to 6 inches in diameter, sell for \$1.80 to \$2.00 per hundred. Shingle bolts of pine 18 inches long are worth 85 cents per cord. Fire wood of mixed species 50 cents per cord. The demand of the district is large. Long hauls and scattered growth make intensive operation where it ought to be carried on, prohibitive within the State Forest.

Erosion.

Erosion is taking place on the bare hillsides. The lack of tree cover is responsible. On the steeper portions a number of slides of earth have taken place.

Insects and Fungi.

The hemlocks in this region are being attacked generally by two species of borer. Whether the disappearance of the surrounding forest induced the coming of the insect or the presence of the insect is first responsible for the injury to the trees, we have not been able to determine. Much of the present stand of beech is dying from a dry rot which affects the trunk and the crown. It is also attacked by white aphids. There are lesser forms of insect and fungus attack but none so serious as those on the hemlocks and beech. The tent caterpillar and the pine aphids were especially present.

Forest Fires.

During the year 1912 there were no fires within this forest. In 1913, four fires burned within the forest, covering an area of over 2,040 acres. The most extensive fire covered 2,000 acres of State land and burned for 5 days in May. In every instance but one the origin of the fire was unknown. This one case resulted from the burning of a fallow and covered only one acre of State land. Accessible high points are used as observatory stations. The fire wardens responded promptly. The value of the telephone in fire-fighting service was demonstrated in these fires.

Outing and Recreation.

Hunting and fishing are the chief recreations, 18 camps being established during 1912 with 95 campers. A few located without permits but this was remedied by a visit from the forester. Deer were not abundant, only two being reported killed during the season. Smaller game was more abundant except squirrels, quail, and woodcock, which are scarce. Bears are plentiful but none were killed. Weasels, wild cats, skunks, raccoons, and foxes abound and are probably responsible for the decrease of better game.

In 1913, 10 camping permits with 81 campers were issued into this forest. Three deer were killed on State land. Smaller game was abundant, except quail and squirrels. Great numbers of weasels, foxes, wild cats, skunks, and raccoons were trapped and shot.

Twelve cans of trout were planted during the year. The bass and trout fishing were fair.

All camps in this division will be numbered from 4,401 to 4,499 inclusive. 8 regular camping sites have been prepared and posted.

The State Forest is also used for picnics and for the gathering of fruits and berries.

Lightning Report.

All trees struck by lightning in 1912 were dead except one red pine and one white pine. The number of bolts was 29, with the following species struck:

Shortleaf yellow pine,	1
Pitch pine,	2
White pine,	11
Hemlock,	8
Chestnut,	6
Gum,	1
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	29

The periods of greatest frequency were the months of July and August, with 12 bolts each. Two of the pines thus struck were ignited and burned. In every instance the lightning was accompanied by rain, thus no doubt preventing other fires.

Forty-five lightning bolts struck during the year 1913. The periods of frequency were as follows:

May,	2
June,	6
July,	12
August,	11
September,	3
October,	1
November,	9
December,	1
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	45

The species struck and shattered were:

White pine, living,	6
White pine, dead,	5
White oak, living,	3
Chestnut, dead,	9
Hemlock, dead,	15
Hemlock, living,	2
Maple,	1
Norway pine,	1
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	42

Struck and ignited:

White pine, dead,	1
White pine, living,	2
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	45

41. THE STONE FOREST, CHATHAM DIVISION.

Forester, C. C. Miner,* Middlebury Centre.

Forest Ranger, George A. Stebbins,† Sabinsville.

Topography.

"This forest lies in the Wisconsin Terminal Moraine and the action of the glacial period is still to be observed. Two groups of rocks are to be found on the surface, and these have been classified as

(a) The Catskill Pocono group, Oswayo formation, green sandstone and shale.

"The entire forest shows this group and very little else forms the basis of the soil.

(b) Sharon Conglomerate, Pottsville formation, white quartz.

"The white quartz easily crumbles when exposed to the weather and the sand bed of Little Asaph country is caused by an outcrop of the quartz and the action of the elements.

"The soil on this forest is either shaly in nature or else a sandy loam. On most mountain sides the green sandstone is to be found as flat rocks of small size mixed with the humus.

"The general topography of this forest is mountainous, or, strictly speaking, a dissected plateau. Steep slopes and plateau are found in nearly equal areas.

"The prevailing climatic conditions are peculiar, and throughout the Pine Creek watershed these conditions seem to be general, very warm days and rapid cooling during the night. It is observed that the growing period is seldom longer than 13 weeks. The period for 1913 was 12 weeks from a killing frost to another killing frost. The mean summer temperature is placed at 68 degrees F. and the mean winter temperature at 23 degrees F. Maximum summer temperature was

*Resigned September 30, 1913.

†Began service July 1, 1912; resigned September 30, 1913.

103 degrees F. for the past summer. The warm winter with mud and rains caused an unusual amount of heaving in the forests and farming lands."

This division of the Stone Forest is in the northern part of Tioga county, and was defined in 1910. In it are included parts of Chatham, Delmar, Shippen, and Middlebury townships. There is considerable flat land on the top of the ridges. The slopes to the streams are steep. They are cut at intervals by spring drains. Swamps are found on the upper flat areas with elevations of 2,000 feet. The boundary lines of the division are all surveyed with the exception of the 1912 additions.

All surveyed lines have been brushed, blazed, posted, and corners rebuilt.

All springs and plantations have been marked with proper notices. There are a number of interior tracts aggregating several hundred acres. Some are purchaseable at this date while others are not.

The stand throughout is much the same. It has been lumbered three times. No virgin forest is found.

The present area of the division is 11,329 acres. No purchases were made during 1913. An area of 1,500 acres contains a quantity of mature and hypermature forest. From this 150,000 board feet of lumber may be taken. The trees are scattered and cost of transportation is such that it could not be removed at a profit. No area has a density of stand over 50 per cent. From 7,000 to 8,000 acres have a density of from 10 per cent. to 50 per cent. All material is small and there is no market for it. Continued protection is its chief requirement. 2,000 acres are covered with brush. This is coming slowly under regeneration. About 1,000 acres may be planted at this time. This has been laid bare by forest fires. There are no rocky areas such that regeneration will be impossible. Springs and streams occupy 100 acres; roads and trails 150 acres; fire lanes, 50 acres.

Springs and Streams.

There are no large streams on the division. It is well equipped with a number of unfailing springs which are the sources of small streams. All main springs are located on the map. Where not easily accessible, trails have been cut to them. Guide boards carry the names of the springs. All springs are more or less affected by drought. Stream flow is continuous and the possibility of contamination is remote. One slight case was detected and promptly corrected. All springs have been located and many of them improved. They are marked with signs at the fire trails. Most of the streams are steady throughout the year.

Buildings and Repairs.

The buildings in this forest consist of a tool house and the house at the Reese camp. The former was recently built and the latter repaired. There are no telephone lines on the Chatham division. There is one fire tower but it is without telephone connection.

Roads.

A system of roads has been worked out to connect with those built by the forester at Asaph. Market conditions and fire danger were taken into consideration in laying the plan. The area is now well accessible by means of the road system. At present the total length of open roads is about 30 miles; trails, 25 miles; boundary lines, 7 miles.

Leases.

There is one outstanding lease with C. W. Reese for the removal of dead and down timber.

Seed Collection.

Little good seed could be gathered in 1912 because of the spring frosts. 15 pounds of maple seed were procured and sent to the Asaph nursery.

Plantations.

Three pounds of pine seed and 15 pounds of sugar maple were sown within the forest in 1912. Plantings for the year 1912 are as follows:

White pine,	101,700
Scotch pine,	9,600
Norway spruce,	10,000
Red oak,	20,000
White ash,	9,000
Honey locust,	500
Willow cuttings,	4,000
Total,	154,800

During 1913 the following plantations were made:

Seed.

European larch,	1 pound
White pine,	2 pounds

Seedlings.

European larch, 2-year,	3,900
Norway spruce, 2-year,	7,300
White pine, 2-year,	126,500
Silver pine, 3-year,	5,000
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Total,	142,700

Plantings to date on this division have been as follows:

Seeds.

White pine,	6 pounds
Scotch pine,	1 pound
European larch,	1 pound
Red oak,	2 quarts
Black cherry,	50 pounds
White ash,	50 pounds
White walnut,	1½ bushels
Black walnut,	1 bushel
Rock oak,	8 bushels
Hard maple,	15 pounds

Total seedlings planted to date cover an area of 260½ acres, and the species are as follows:

White pine, 2-year,	248,200
Scotch pine, 2-year,	9,600
Silver pine, 3-year,	5,000
European larch, 2-year,	3,900
Norway spruce, 2-year,	17,300
Red oak, 1-year,	35,000
White ash, 1-year,	10,000
Black cherry, 1-year,	6,800
Honey locust, 1-year,	500
Basket willow, (cuttings),	6,000
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Total,	342,300

Sample Plots.

Three sample plots have been started for the purpose of testing the difference between the soils in the valley and those on the mountain.

Labor.

Work is abundant but laboring men are scarce. High prices are the result. Labor costs 18 cents per hour. A team with man costs \$4.00 per day. A man and one horse 25 cents per hour. The lowest wage paid is 17½ cents per hour. In many instances 25 cents is demanded and received. The local celery farms and railroads pay high prices and it is difficult to procure men for forest work. The quality is good, above the average.

Improvement Work.

A block of 2,500 acres was laid out for improvement, and after being reduced to sections the work of removing all dead and defective trees was begun. All dead and defective material down to a diameter limit of 3 inches was taken. All old dead stubs and dead pine trees were cut down. The material produced did not quite pay the cost of the work, but the gain to the forest is great, much more than the cost. A small number of logs were cut into planks and lumber, material which was needed for use within the forest.

Markets.

The wood-using industries of the locality furnished certain data to the forester and he finds that they will take the following material:

Crate bolts, any species.

Roller bolts, hard maple, large diameters.

Fire wood, any quantity and nearly all species.

Logs for lumber, any quantity and almost any quality.

Shingle bolts, dead pine and live hemlock.

Poles and posts of suitable species.

The markets are close at hand and the demand exceeds the immediate supply.

Erosion.

Only two serious instances of erosion are noted. Forest planting would in a short time stop its progress.

Insects and Fungi.

The usual forest insects are present, the white pine weevil and aphids being most destructive. The chestnut bark disease has not yet appeared in this division.

Forest Fires.

But two fires were started on this division in 1912. Both were extinguished by forest officers. The area burned was less than an acre. During 1913, fires were limited to an area of $10\frac{1}{2}$ acres. The damage was small.

Outing and Recreation.

Applications were honored for 5 different camps and a larger number of permits was issued than formerly. Fishing was good throughout the season, and some fair catches were made. Trout were planted in Canada Run. One doe was reported killed during the 1912 hunting season. A few over-night permits were issued in 1913. The conduct of those who used the forest is improving. They are beginning to understand the force of the presence of the State in the neighborhood for protection and restoration of forests. Many persons from the nearby towns and villages come out into this forest. Our improved roads make it accessible to visitors.

Lightning Report.

Thirteen trees were struck and shattered during 1913. Three were not on State land. The period of greatest frequency was during the months of July and August. The species are as follows:

White birch,	1
Chestnut, dead,	4
Hemlock,	5
Elm,	2
Black locust,	1
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	13

No trees were ignited.

Fourteen trees were struck and shattered during 1913. The period of frequency was as follows:

May,	1
July,	6
August,	5
September,	2
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	14

The species struck were:

Chestnut,	3
Hemlock,	6
Birch,	1
White oak,	1
Rock oak,	1
Live chestnut,	2
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	14

42. THE KETTLE CREEK FOREST, LEIDY DIVISION.

Forester, John L. MacAvoy,* Hammersleyfork.

Forester, Walter M. Mumma,† Hammersleyfork.

Forester, Max E. Müller,‡ Hammersleyfork.

Forest Ranger, William S. McCoy, Leidy.

The Leidy division of the Kettle Creek Forest is situate in Leidy township in the northwestern portion of Clinton county. Kettle Creek drains the larger part of it. The area is very irregular in outline, consisting of two main blocks, one on each side of Kettle creek and a number of smaller areas broken up by private land.

The region in which it is situated is mountainous throughout and very sparsely settled. The soil is comparatively poor and few of the farms pay. Timber has always been the chief source of wealth in the neighborhood.

The geological conformation consists of white Pocono sandstone and red Pocono shale. The former is sometimes used for stone and masonry work and some of the latter makes good flag pavements. Narrow benches near the top of the mountains and irregular draws or hollows on the sides of the ridges are characteristic. Great blocks of coarse sandstone or conglomerate are found on the tops of some of the mountains. Traces of coal and iron exist and three recently driven gas wells near Hammersley have an apparently good flow.

Lumbering on a large scale was carried on in the neighborhood till within seven years ago. When the virgin forests were exhausted the lumbermen moved elsewhere and a large part of the population fol-

*Transferred to Leidy Div. April 1, 1912; to Stuart Forest March 1, 1913.

†Transferred to Whetham April 1, 1912.

‡Appointed September 1, 1913.

lowed. What had been one of the grandest pine and hemlock producing areas of the State was soon reduced to a condition bordering upon desolation by repeated fires. As the slash and debris disappeared, however, these did less damage so that now a mixed growth of hardwoods, consisting chiefly of sprouts, has replaced to a great extent the former evergreen stands.

The boundary is unsurveyed. In many cases no one knows where the State and private lands join. The irregular shape of many of the tracts adds to the difficulty. Many of the old corners have been destroyed in lumbering and there is doubt about the identity of others. All the corners and lines that are definitely known have been posted. With such conditions existing, prevention of trespass has been hard and the necessity of an early survey is keenly felt.

The area is mountainous throughout. Kettle Creek flows in a southerly direction in a tortuous manner and its tributaries coming in from either side cut out ridges running east and west. This is the only hint of irregularity in the configuration. At the head of the creeks the mountains seem heaped up at random. The side hills are very steep, often forming angles of 50 and 60 degrees. Some of the larger mountains are slightly flat on the top but as a general rule they are sharp and ragged. Benches, due to geological formation are a characteristic. These, however, are never very broad.

On the whole the climate is regular. Spring is the most dangerous season for fires. The year 1913 was marked by damaging June frosts.

The total area of this division is about 18,600 acres and of this about 125 acres supports mature timber consisting mostly of hemlock, approximately 100,000 feet. In most cases this is deteriorating and prone to windfall. Mixed in with this is a little chestnut and oak suitable for telephone material. Besides this there is considerable small stuff which has been killed or injured by fire and should be removed. Most of the younger stands, nevertheless, are very promising. We can distinguish two distinct main types. In the first, chestnut, rock oak, and white oak predominate. This type prevails on the eastern half of the area. The second, is the familiar beech, birch, and maple mixture interspersed with basswood, red oak, and other species. These stands range from mere shoots up to four and five inches in diameter. In some cases, weed species like fire cherry, aspen, or scrub oak are found mixed in with the more valuable permanent growth but pure areas of weed growth of large size are not found. There are about 1,000 acres on which planting is necessary. Fires have thinned out some of the stands and where fire can be kept out much of the area will in time reforest itself with valuable species. This is well illustrated by a few slopes where good white pine regeneration is creeping in under an advanced growth of aspen and other hardwoods,

Not more than one-third of the total area of the division has a density of 50 per cent. or greater. About 9,000 acres are covered with a growth ranging in density from 10 per cent. to 50 per cent. 25 acres comprise the water, stream, and swamp land areas. Roads, trails and fire lanes occupy 35 acres.

Springs and Streams.

The best springs are cleaned and made accessible. The naming and posting of the springs is progressing and will be finished next season. springs are numerous. The larger ones flow steadily throughout the year. Streams are variable in flow. Since the disappearance of the wood cover the residents report higher and lower water than formerly. There is almost no contamination.

Buildings and Repairs.

A small building has been purchased at Crossfork and will be removed at once to Hammersleyfork to be used as an office building. There are no other buildings on this forest.

Roads.

The total number of miles of road opened in 1912 is $10\frac{1}{2}$; fire lanes, 6 miles. The roads need an almost complete rebuilding. Many old roads may be converted into good highways with the expenditure of a little effort.

During 1913, $17\frac{1}{2}$ miles of old roads, trails, and fire lanes were repaired and 5 miles of new lines opened. 7 miles of pipe line right of way are kept open by the National Transit Company. This affords a favorable base for protection. This pipe line right of way of the National Transit Company is the only easement existing within the division.

Plantations.

During 1912, the following seedlings were planted on 9 acres. Three-year-old transplants from one-year seedlings were used:

White pine,	8,000
Norway spruce,	2,000
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	10,000

The planting during 1913 comprised 100,000 white pines, using three-year-old seedlings.

Ninety-five acres of the forest area have been planted to date. 25 acres of this area are in open fields and meadows. Seedlings planted to date are as follows:

White pine,	126,500
Norway spruce,	3,000
Scotch pine,	500
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	130,000

Labor.

The better class of laboring men in this region receives \$2.15 per day. Team hire costs \$4.50 per day. Formerly the wage for laborers was 16 cents an hour, but this is so low that the quality was below the average. The only industry in the region at present is farming. Much of the best labor has left the region, although much of that which remains is of good quality. The residents willingly assist in the extinguishment of forest fire.

Markets.

Local markets can scarcely be said to exist. Sawed lumber is called for in Renovo. Local saw mills at Tamarack find a market for mine ties in the clay mines. Fuel wood is worth \$3.00 per cord chopped, split, and delivered. On the stump and dead it is almost impossible to sell. The nearest railroad is 14 miles away.

Insects and Fungi.

The white pine weevil is destructive in this locality. Probably 50 per cent. of the young white pines have been attacked. The locust borer is present.

Forest Fires.

Two fires occurred during 1912, only one of which was on State land, burning 200 acres. The damage was slight. In past years this region has been severely burned, which accounts for the sparse growth on some portions of the State Forest. Protection is at present the chief aim of the forest administration. An outlook tower is in process of building and new fire lines are being added. All fires are believed to be started from hunters, fishermen, and berry pickers. During 1913, 6 different fires burned upon State land, covering a total area of about 3,200 acres. Because of the weed growth the immediate actual damage was small.

Outing and Recreation.

Hunting in the region is good. 6 bucks and 7 bears were taken during 1913 on State land and in the neighborhood. Trout fishing is fair. Bass, eels, and suckers abound in Kettle Creek.

All camp sites within this division will be numbered from 2,301 to 2,399 inclusive. 6 camp sites have thus far been located and improved.

Lightning Report.

The period of greatest frequency was during the months of July and August. 9 bolts were counted, two of which ignited the trees, a white pine and a hemlock. The species struck were as follows:

Chestnut,	4
Hemlock,	3
White pine,	2
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	9

During 1913 only one stroke of lightning is known to have occurred within this division, a chestnut having been struck in the month of **July**.

43. THE TROUGH CREEK FOREST.

Forester, W. Elmer Houpt, Aitch.

Forest Ranger, John M. Stever,* Cassville.

The Trough Creek State Forest lies in Huntingdon county and includes what are known as the Brumbaugh and Kendig tracts. There are no interior tracts.

The area of this forest is approximately 6,100 acres. The boundary is surveyed and the lines painted and posted. The corners are well marked and plainly witnessed.

The reserve is bounded on the northwest by the Raystown branch of the Juniata. The river flows along the foot of Terrace Mountain, in a very meandering manner. This is due to the soft narrow belt of Catskill formation through which it flows. It crosses incessantly from side to side, rebounding from the ridges of upper Chemung sand rocks on the left, to the solid Pocono sandstone mass of Terrace mountain on the right.

Just below Paradise Furnace, Trough Creek begins its gorge-like passage through the Pocono sandstones of Terrace Mountain, following the axis of the trough northward, and frequently descending in rapids until it reaches the Raystown branch. The gray sandstone cliffs through which it flows have in some places a perpendicular height of two or three hundred feet.

The surface features are entirely unaffected by glacial action, although boulder deposits occur along the Raystown branch, but never more than about 50 feet above the level of the water. These boulders consist largely of Pocono sandstone, large ledges of which overhang the stream at many places.

Surface rocks are sandstone and shale. Along the slopes of the mountain the sandstone covers the surface completely, while on the benches and top the sandstone is hidden, and a good soil is found. Along the Raystown branch small ridges of red shale are found. The ridges are steep, and the shale is hard to the surface, causing the soil to be very thin and poor. Throughout what is locally known as the Barrens, the sandstone is hidden, except in ravines and hollows. Here the soil is of a sandy nature and of a poor quality, due to the frequent fires which have robbed the soil of its humus.

The reserve is exceedingly rough, with altitudes varying from 750 to 1,400 feet. The grade of the slopes varies from 25 to 60 degrees. The slope of Terrace Mountain facing the river is exceedingly steep.

*Resigned September 30, 1913.

This is also true of the gap through which Trough Creek flows. The southeast slope of Terrace Mountain is gradual, being formed by rolling hills and shallow valleys, all of which have a general trend to the south, forming what is known as the Barrens.

The climate is not of the best. During the fall and winter heavy winds sweep the whole area, while in the summer the air is hazy and sultry. Frequent thunderstorms of great violence occur. They travel mostly in a northeasterly direction.

About 1,000 acres have a density of 50 per cent. or over, and are in need of improvement. Proper thinning would produce a large quantity of material, probably a million feet of saw timber, 20,000 railroad ties, 600 cords of pulp wood, bark, pit posts, and extract wood. The species are principally hardwoods mixed with pitch pine. Markets are good and everything can be handled with profit. 2,930 acres have a density of from 10 per cent. to 50 per cent. of the same species. From this portion one million feet of pitch pine could be removed as pulp wood or mine props. Freight rates will average about \$10.00 per car. 1,400 acres are brush land and may be reinforced by spot planting. Seedlings may be planted on 600 acres. 95 acres are covered with rocks, 24 with water, 30 occupied by roads, 28 by fire lanes.

Springs and Streams.

All springs have been located on the forest map and have been cleaned and made accessible. A number are being walled. All map springs have continuous flow. The larger streams, Raystown branch of the Juniata and Trough Creek, are irregular in flow because of the heavy runoff. The surface of the land contains little humus. Sulphur water from the mines enters Trough Creek.

Buildings and Repairs.

The old stone house at the Forge is the only structure worth mentioning. If repaired and the grounds improved it will make a good house for a forester or a ranger. The Bell Telephone lines pass within a half mile of this forest. The service is good, at a rental of \$1.00 per month. Nearly all local homes are supplied with the telephone. A rural line connects with the Bell at Huntingdon.

Roads.

The total mileage of open road at present is $14\frac{1}{2}$ miles; fire lanes, 6 miles. All the roads are in poor condition. A model road could be made out of the township road running along Trough Creek.

Roads, trails, and fire lanes were repaired during 1913 for a distance of about 9 miles. 5 miles were fire lanes, the remaining 4 miles regular wagon roads.

Leases.

The Juniata and Southern Railroad has a right of way 60 feet wide with a 20-year lease, through a portion of this forest. While it furnishes easy access to market, it increases the fire danger.

Minerals.

In the face of the rocks along Trough Creek there appears a 6-foot vein of coal. Its extent and quality are not known.

Seed Collection.

A small quantity of seed of dogwood, papaw, and red oak were gathered during September and October, 1913. The red oak was kept for use within the forest, while the others were forwarded to the Department.

Plantations.

Fifteen thousand 3-year-old transplants were set out during 1913. Two bushels of black walnuts and two pounds of white pine seed were put into plantations.

The area planted with seedlings to date is 16 acres. The total number planted is 45,000, principally white pine.

Sample Plots.

Two sample plots, using white pine and walnut, were made near the Duncan and Wills camp during 1913. White pine covers 4 acres and walnuts $1\frac{1}{2}$ acres.

Labor.

Unskilled labor costs 16 cents per hour, two-horse team with driver, 40 cents per hour. The building of the railroad has raised the cost of labor, but the quality is poor.

Markets.

Prices are fair but will improve shortly. The available private supply of timber is limited and is being rapidly marketed. Freight rates are too high. Transportation will be much better when the new railroad is constructed. There is use for ties, posts, rough saw timber, car timber, mine props, telephone poles, and pulp wood.

Erosion.

When the forest cover is removed from any of these lands, erosion begins quickly. On the Brumbaugh tract where the ridges are steep, erosion rapidly follows a fire. The Kendig tract is rolling in nature and little washing takes place.

Insects and Fungi.

Six hundred chestnut trees were found attacked by the chestnut bark disease. The trees were destroyed and the stumps burned. The white pine weevil has appeared in some of the plantations. Where detected, the attacked trees were removed and burned.

Forest Fires.

During 1912 but one fire occurred within this forest and burned over an area of 10 acres. The loss was small. There were no forest fires during 1913. A 30-foot fire tower has been erected on a high point.

Outing and Recreation.

No camping parties with permits located within the forest during the year. Picnic parties near the old Forge are common. A camping club near Calvin located on private ground but hunted over State land with a crowd of 25. A report of the game and other animals taken, includes 11 bucks, 2 does, 2 wild cats, 70 pheasants, 300 squirrels, and 50 rabbits. Fishing is poor. Laurel Run is the only stream containing trout and not more than 100 were taken. The Raystown branch was stocked with black bass and occasionally good catches are made. All camp sites within this forest will be numbered from 4,701 to 4,799 inclusive.

Lightning Report.

During 1912, 41 trees were struck and shattered. The period of greatest frequency was during the months of July and August. The species are as follows:

Chestnut,	17
Pitch pine,	10
Black oak,	3
White oak,	3
White pine,	2
Hickory,	2
Hemlock,	2
Pin oak,	2
	<hr/>
	41

Twenty-six strokes of lightning are reported during 1913:

Chestnut,	7
Pitch pine,	8
Black oak,	4
White oak,	3
White pine,	2
Hickory,	1
Hemlock,	1

The periods of frequency were as follows:

May,	5
July,	12
June,	7
August,	1
September,	1

44. THE WHETHAM STATE FOREST.

Forester, J. B. Ryon, Glen Union.

Forest Rangers:

A. M. Wilson,* Glen Union.

R. K. Merrill,† Glen Union.

The Whetham Forest, situate in Colebrook, Gallagher, Grugan, Chapman, and Noyes townships, is divided into two unequal sections by the West Branch of the Susquehanna River, along which, running east and west, is the Philadelphia and Erie Division of the Pennsylvania Railroad. It is located near the central part of Clinton county between Lock Haven, the county seat, and Renovo.

Geological Features.

The summits of the mountains are capped by conglomerate sandstone which in places juts out in shelflike cliffs. The exposures of sandstone display a varied geological formation, often thinning down, becoming less coarse, and having an appearance not unlike the Pocono

*Left service January 31, 1912.
†Began service March 15, 1912.

sandstone, which lies in next to the conglomerate, the former being of a grayish color and fine grained. In particular localities the outcroppings approach the true Pottsville conglomerate having rounded pebbles measuring $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in thickness. In places where exposures are good the Pocono sandstone can be seen, but such cases are of rare occurrence.

The soil is a sandy loam, formed by the disintegration of the underlying sandrock. It is shallow and has a rich clay sub-soil of considerable depth in places, and which, has never been mined to any extent, though it has been attempted. The soil is well drained except on the benches where an excessive amount of water issuing at their heads, and caused by a singular formation, gives rise to a swampy condition and produces a growth of grass and other vegetation. The higher lands or flats being cold and stiff, contain very little ground that can be profitably used for agricultural purposes. Some of the side hills are covered with detritus of the conglomerate sandrock. Here soil is usually wanting. This is the case because the sandrock contains an insoluble cement and resists erosion. Consequently most of the rainfall quickly finds its way to the small mountain streams, often causing in a few hours a rise of several feet. The soil in the bottom lands along the Susquehanna River is better adapted for farming. It is of a more sandy nature than the mountain soil.

The surface here described is not of glacial deposit as is evident from the numerous side hills below the benches which contain fragments of the conglomerate sandrock. The presence of this rock indicates that glacial action has not taken place.

Topography.

The escarpment of the Allegheny mountains presents a rather irregular face, running approximately east and west. The presence of the Eagleton or Ferney Run anticlinal near the eastern extremity of the forest produces the high lands in this locality. It presents a slight dip toward the north. The Whetham basin north of it is shallow and hardly more than a roll or slight fold compared with the Hyner anticlinal which is next in order, and which is also the most important axis in Clinton county. It extends southwestwardly forming the high lands in the country south of the Susquehanna River. Barometric readings show a rise of more than 2,100 feet and a relative rise of 1,460 feet, compared with a rise of 1,600 feet and a relative rise of 1,000 feet in other portions of the forest.

At the head of Johnson Run near Whetham one or two of the lower coals are brought down into the hilltops by the Whetham Basin, but the area is believed to be small and the coal too soft to be marketed.

This trough may probably be the equivalent of the Towanda mountain synclinal, though not necessarily continuous with that flexure.

The country is wholly or partially drained by the following streams: Lick Run, Ferney Run, Johnson Run, Rattlesnake Run, Mill Run, Grugan Run, Little and Big McCloskey Runs, and Quell's Run. All have their sources at the heads of the hollows which have a general trend of northeast and southwest and end at the great valley of the West Branch of the Susquehanna River. They divide the region into three distinct topographical aspects, namely, plateau, hilly, and mountainous. The last represents approximately one-half of the entire area, while the others occupy each one-half of the remaining area.

The presence of the conglomerate sandrock forms distinct terraces or benches near the summits. They are of two classes, those in which the top of the sandrock forms the flat or bench, resulting only when the sandrock or conglomerate is compact with a cementing material not readily soluble; and those in which the shales or slates underlying the sandrock or conglomerate form the bench, always occurring when the rock is friable, and with but little or an easily soluble cement which gives way to the action of water and climatic influence. In terraces of this latter class the sandrock is eroded more rapidly than the underlying rocks, its face recedes and leaves a bench in front of it. Springs issuing at the foot of the sandrock escarpment or nearly on a level with the bench trickle across it and produce the swampy condition before mentioned.

Local Climatic Conditions.

This region is subject to a large range in temperature. The summer and winter seasons may be said to be almost equally divided as to length, the former bringing numerous and often excessive hot spells, while the winter season is cold and at times severe. Frost occurs about six months during the year, beginning some time in October. Late in the spring of 1913 a frost occurred which slightly damaged the young trees and other forms of vegetation. This, of course, is very unusual and no doubt was general throughout this part of the State. During the night a heavy mist invariably settles in the valleys and vanishes the following morning on appearance of the sun. This is most noticeable during the warm season and preceding and during a wet spell. The movement of the mist up the mountains accompanied by an east wind, which in this locality blows up the river, is certain sign of an approaching storm. The mist is occasioned by the presence of the Susquehanna River and other smaller bodies of water.

The prevailing winds apparently come out of the northwest. Observation has shown that toward evening the winds come out of the west provided the weather is fair and no storm centers are within

ten or twelve hours of this point. Otherwise they arise from a southerly source.

During the summer months this region is visited by numerous and frequently destructive electrical storms, which, together with the occurrence of the more general precipitation at frequent intervals, keep the mountain streams and springs abundantly supplied with water.

The year 1860 marked the beginning of active lumbering in this locality. Previous to this, the work was carried on in a desultory manner.

In 1860 William E. Hill began to lumber in the territory included between Johnson Run and Rattlesnake Run, Grugan township. This lasted for a period of about ten years. From 1865 to 1873 Harry Cline and Dudley Blanchard operated in the vicinity of Rattlesnake Run, Grugan township. In 1860 Ritchie Brothers commenced to operate in the Ferney Run country, Grugan and Colebrook townships, finishing about the year 1870. The cutting at this time consisted mainly of virgin white pine and oak.

In 1862 Perry Dean put up a small mill at the mouth of Ferney Run and sawed nothing but white oak, which was utilized as car lumber. He also engaged in peeling hemlock bark, allowing the logs to remain in the woods to be destroyed by fire. The two years following Mr. Dean saw William L. Torbett operating in the country in the vicinity of Ferney Run. The latter cut principally prop timber, completing his work about 1888. In this same year came William Boyer, who cut everything that remained on the ground, including paper wood. He withdrew from the locality in 1896. Rattlesnake Run and surrounding country was again invaded in 1884 by Christ and Fieldman, this time for the removal of prop timber. At the conclusion of the latter operation, paper wood was cut until the year 1888.

About 1885 a clay prospect was made in the vicinity of Left Sugar Camp, Grugan township, by George Gould and Robert Lewis under the direction of Christ and Fieldman. Clay was found to exist but the operation was not developed any further.

A coal pit was opened by William E. Hill at the head of Johnson Run, Grugan township, in the year 1861. Coal was dug for a period of four years, and used as fuel in his blacksmith shop while lumbering.

Lumbering operations carried on in McCloskey Run territory, Chapman township, were as follows: From 1860 to 1870, N. E. McCloskey cut the virgin white pine and oak. He was succeeded by James E. Robbins. In recent years Samuel Wallace put up a small mill at the mouth of McCloskey Run and sawed up what scattered trees remained, making boards, two by fours, railroad ties, and other lumber.

In the early 60's, Abner McCloskey lumbered in the vicinity of Dry Run, Grugan township, across the river from Ritchie. He was succeeded by William Sykes, who operated from 1878 to 1879. About

eight or nine years following the latter, Sykes and McCloskey together removed all the hemlock from the country facing the river in Grugan and Chapman townships.

The boundary survey is complete and the line brushed out. The lines above the river have been painted. The area of this forest is 19,000 acres. The portion below the river has an area of 4,080 acres, and that above the river nearly 15,000. 2,500 acres have a density of 50 per cent. or more, and 7,000 acres have from 10 per cent. to 50 per cent. All of this tract is in need of improvement. Protection is the chief need in the immediate present. The principal species are chestnut oak and pitch pine. The 9,500 acres mentioned are known to contain millions of feet which ought to be removed and would make ties, props, and pulp wood. A ready market for pulp wood is at Lock Haven. Mining districts would take the props and ties, and the railroads the railroad ties. 9,500 acres contain little but scrub oak. 3,000 acres will require artificial reforestation. 6,500 acres will reforest themselves if well protected. There are no rock areas such as will prevent artificial planting. Roads and fire lanes occupy an area of 53 acres; the water surface is 15 acres.

Springs and Streams.

These are numerous. The larger streams rise in the upper flats and flow in a southerly direction, reaching the Susquehanna. Stream flow continues throughout the dry season, although slightly diminished. The volume of flow is large. A number of small streams abound. Nearly all the springs are along sides of ravines. These have been cleaned and made accessible and in some instances walled up. The water is pure and free from contamination. During excessive droughts a few of the springs lose water. All important springs are named and posted.

Buildings and Repairs.

The State owns three buildings within this forest, the principal one at Whetham occupied by the forester and the ranger and his family. It is in poor condition. The other buildings are of little value and are remnants of the lumbering period. The lines of the Bell Telephone system pass the forester's headquarters but there is no telephone connection. The expense would be too great. There is a railroad telephone line connecting the towers and a Standard Oil Pipe Line telephone along their right of way.

Roads.

Road improvement at a distance from headquarters can only be done by camping in the region. As soon as proper camping facilities are

at hand, distant roads will be worked upon. During the year 1913, 42.7 miles of roads, trails, and fire lines were improved.

Minerals.

An outcropping of bituminous coal is found on the hill between Rattlesnake Run and Johnson Run in Grugan township. The vein is 32 inches in thickness. Its extent is not known. Rich clay deposits occur but little mining has been done.

Plantations.

During 1912, 16 acres were planted to seedling trees and 35,000 of the following species were planted:

White pine,	15,000
Norway spruce,	10,000
Scotch pine,	10,000
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	35,000

Plantings during 1913 were as follows:

Norway spruce, 2-year,	7,100
Pinus ponderosa, 2-year,	1,000
White pine, 2-year,	20,400
Scotch pine, 2-year,	6,100
Sugar maple, 2-year,	4,600
Black cherry, 1-year,	900
	<hr/>
	40,100

All planting to date has been converged at one point so as to make protection as sure and easy as possible.

To date 52 acres have been planted with seedlings, using the following species:

White pine,	55,400
Norway spruce,	17,100
Scotch pine,	16,100
Pinus ponderosa,	1,000
White ash,	8,000
Sugar maple,	7,000
Black cherry,	900
	<hr/>
	105,500

Nurseries.

A small nursery of about one-sixth of an acre was begun in the spring of 1912. It has since been reduced to about 1-16 of an acre. The first year it produced the following stock:

Norway spruce,	30,000
White pine,	15,000
Douglas fir,	4,200
Scotch pine,	3,000
	<hr/>
	52,200

Eight pounds of seed were used in the nursery during 1913:

Norway spruce,	2 pounds
White pine,	4 pounds
European larch,	2 pounds
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	8 pounds

The following seedlings formed the stock at the end of the growing season:

Norway spruce, 2-year,	29,500
White pine, 2-year,	9,200
Scotch pine, 2-year,	8,800
Douglas fir, 2-year,	4,200
	<hr/>
	51,700

The mole cricket is found to be doing some damage by eating seeds before germination. The cost of bringing these seedlings to the age of two years was highest in the case of white pine, \$1.47 per thousand, and lowest in the case of Norway spruce, \$1.01 per thousand. It is maintained principally as an educational object but is capable of such enlargement that it may in the near future supply practically all the seedlings needed for planting from year to year in this forest.

Sample Plots.

The only sample plot now under study is the dynamite experiment referred to elsewhere, and to be reported on later.

Labor.

Labor costs \$1.75 for a ten-hour day, or \$1.40 per day with board. Teams cost \$5.00 per day. Labor is extremely scarce and not a person in the whole region can be depended upon when needed. An earnest desire for work is not specially prominent.

Markets.

The chief market is for railroad ties. The Philadelphia & Erie Division of the Pennsylvania road borders the forest for 8 miles and uses 8,000 ties per year. The prices according to grade and species run from 25 cents to 72 cents each. Transportation is good. Numerous sidings exist for the loading of cars. Mine props go to the hard coal region with cost for freight from \$1.35 to \$1.50 per ton. Pulp wood is taken by the paper mill at Lock Haven. A special rate of 50 cents per ton for freight prevails. Private operators in the neighborhood are supplying great quantities of ties, poles, and pulp wood, as well as sawed lumber. The following is the recent production in this region:

Standard railroad ties, 7,700.

Mine ties, 2,800.

Mine props, 1,125 tons.

Pulp wood, 50 tons.

Sawed lumber, 95,000 board feet.

These figures indicate the possibility for the State Forest when private lumbering ceases.

Erosion.

The hillsides are generally well covered and erosion is at a minimum.

Insects and Fungi.

The insects and fungi common to forest regions are found to be prevalent. No very destructive ones exist. The chestnut bark disease has not yet been reported.

Forest Fires.

Two fires occurred within this forest during 1912 and burned over an area of 58 acres. The injury was principally to the ground cover and was not great. Fires come mainly from the throwing of sparks by locomotives. The exposure to this fire danger is great because at least 9 miles of railroad pass through the State Forest. Small fires start frequently along the railroad right of way, but are extinguished quickly by railroad employees. The forest has one fire lookout which is well situated.

During 1913, 6 different fires burned over about 300 acres of State land and nearly 1,000 acres of private land. The damage in each instance was confined almost entirely to the dry leafy cover. The

New York Central Railroad, which runs some of its trains over the Pennsylvania, is the chief offender and a constant watch must be kept during danger seasons.

Outing and Recreation.

Fifteen camping parties located within the forest during the open deer season in 1912. About 112 men composed the camps. 30 deer were killed in the locality and a large quantity of smaller game. 6 bears were reported killed.

In 1913, 17 camping permits for 110 persons were issued. 30 deer and 7 bears were taken. Small game was abundant and large quantities were had. Fishing was good.

All camp sites in this forest will be numbered from 4,801 to 4,899 inclusive.

Lightning Report.

Nine strokes of lightning were reported for the year 1913:

June,	1
July,	1
August,	4
September,	3
	<hr/>
	9

Trees struck and shattered were:

Chestnut,	4
Chestnut oak,	2
Pitch pine,	1
White oak,	2
	<hr/>
	9

No trees were ignited so far as known.

45. THE WHITE DEER FOREST, BUFFALO DIVISION.

Forester, A. C. Silvius, Laurelton.

Forest Rangers:

Charles L. Braucher,* Hartleton.

Carl Motz, Woodward.

John Rutherford,† Laurelton.

This division of the White Deer Forest is included wholly within Hartley township, Union county, and Haines township, Centre county. After it is carefully marked the brushing out will take place. There are few small interior tracts of little value and their acquisition would confer some benefit. Certain exterior tracts are needed to straighten boundaries. The total area of this division is about 20,200 acres. The forest is rugged and mountainous with elevations varying from 600 to 1,400 feet above sea level. It is not suited for any other purpose than tree culture. The boundary survey is completed but the marks need brightening at a number of places.

There remain no virgin forests, although there is a portion of the original stand consisting largely of hypermature hemlock on the north side of Paddy mountain, and also near Woodward. On the Paddy mountain area there is at least 750,000 feet of merchantable saw timber. One-fourth is pitch pine and white pine and the remainder hemlock. About 8,000 acres have a density in excess of 50 per cent. At least half of it is in need of improvement. The timber cover consists mainly of chestnut and rock oak. This improvement can probably be continued with a profit and the material will produce posts, ties, and fire wood. About 9,000 acres have a density ranging from 10 per cent. to 50 per cent. The wood cover is chestnut and oak with some standing fire-killed timber of various species. Spot and broadcast sowing would assist in increasing the density. At least 3,000 acres are covered with scrub oak, huckleberry bushes, briars, and bare rocks. Probably 80 per cent. of this area will be reforested naturally if protected. On the remaining 20 per cent. the soil is thin, bare rocks are exposed, and reforestation is difficult. Probably 10,000 cords of fire-killed timber is at present found within the tract, but is largely inaccessible and unsuited for anything but fire wood. Due to successive burns, an open area of at least 500 acres is now available for planting with seeds and seedlings. 1,500 additional acres are so rocky that little regeneration can be expected after cutting. Streams cover about

*Left service March 29, 1912.

†Began service September 1, 1912; resigned September 30, 1913.

64 acres; roads and trails, 60 acres; fire lanes, 30 acres. With adequate fire protection at least 18,500 acres ought to be reforested within the next twenty years.

Springs and Streams.

All important springs have been located and marked on the forest map. Trails have been cut to them and they are named and posted. These are the continuous springs. There are a number of additional wet weather springs which cease their flow during the summer months. The effect of forest and its absence on stream flow was strikingly illustrated after a fire on May 10th. The litter and the debris on the ground were burned. A very heavy rain followed causing all the streams so affected to leave their banks. For years prior, with a good forest cover, no such occurrence happened. Following the fire new vegetation sprung up. Toward the end of the growing season another rain of about equal volume occurred. The water was carried off without damage and there was no unusual rise in the waters of the streams. There is no contamination at present.

Buildings and Repairs.

There is but one building on the division, a cabin on Buffalo Creek. It is not in bad condition but needs some slight repairs. A telephone line traverses the turnpike through the division. It is little used and the service is not good. Two fire towers have been built which need to be connected with headquarters by telephone. Other towers are needed.

Roads.

Roads to the extent of 23 miles were repaired during 1913. The work consisted of grading, ditching, surfacing, and bridging; also brushing and mowing where needed. There are 11 miles of trails and 10 miles of fire lanes.

Leases.

There is one outstanding contract with L. L. Weaver to remove from the south slope of the mountain near Woodward only the mature and hypermature hemlocks and unsound trees not needed for seed purposes. The contract is about half executed and much of the material moved to the mill. Sawing will begin early in 1913.

Plantations.

During 1912, 11 acres were planted with seedlings, using 30,000 white pine.

In 1913, 34,400 white pine transplants 2-1 year were planted within the forest.

The division contains $24\frac{1}{2}$ acres planted with seedlings and 15 acres with seed. To date 20,000 white ash and 64,400 white pine trees have been planted. A number of the pines were lost by fire in the spring of the year. Approximately 60,000 growing young pine trees remain. Seeds as follows were planted:

White pine,	3 pounds
Scotch pine,	$2\frac{3}{4}$ pounds
European larch,	2 pounds
Douglas spruce,	$\frac{1}{4}$ pounds
	<hr/>
	8

Experimental Plots.

Experimental planting was made at the head of Stony Run in the spring of 1913, and contains 15 acres. This is for the purpose of determining whether direct seeding will be a success.

Nurseries.

A small nursery was started in the spring of 1912 in the forester's garden. It was destroyed by sparrows due to inability to give it needed attention at the proper time.

Labor.

The usual rate paid for labor is 15 cents per hour. Team and driver are worth from \$3.00 to \$3.50 per day. Laborers are abundant and the quality is good. Inferior workmen may be had for a less price.

Markets.

There is small local market for fire wood resulting from improvement cutting. According to quality and species, it sells for from 10 cents to 25 cents per load. There are no local manufacturing industries creating a demand for lumber. All that produced is of low grade and sells from \$15.00 to \$30.00 per thousand feet. The species called for are hemlock, chestnut, white pine, oak, and maple. Transportation facilities are rather poor.

Improvement Cutting.

At present the subject of improvement cutting has not been reached. There is material which ought to be removed from the forest, and a possible market for it in the form of charcoal may be had at Glen

Iron. The price for charcoal there at this time is 10½c a bushel (beech, birch, and maple). Probably 500,000 feet of lumber may be procured from unproductive defective and dying trees of hemlock, pitch pine, and white pine, all of which is hypermature and should be removed. The rough lumber demand in the neighborhood would take all this material.

Erosion.

Where the surface of the land has been severely burned, erosion is taking place, especially on the upper waters of Buffalo Creek. With protection, the return of young growth will probably prevent further washing.

Insects and Fungi.

No insect enemies are at present reported and the chestnut blight fungus is present only with scattered infections.

Forest Fires.

Fires are the great scourge of this region, but during the year 1912 there were no forest fires on State land. In 1913, the area burned amounted to at least 8,600 acres. We may expect fires to continue until a more adequate system of protection is put into operation. There are two fire observatory stations on the division.

Trespass.

There have been violations of the forest laws but it is not possible to detect the guilty persons. A violation of the deer law occurred and this was reported to the Game Commission.

Outing and Recreation.

Hunting and fishing constitute the principal reasons for persons going into the woods. 61 hunters occupied 8 camps in 1912. 8 deer were killed within the division. Smaller game was abundant.

During 1913, 6 camps with 49 persons were on State land. 12 deer were killed, 6 bears, and large numbers of small game.

Five hundred trout were planted in the waters during the autumn.

All camps in this forest will be numbered from 4,901 to 4,999 inclusive. 17 such camp sites have been prepared and named.

Lightning Report.

But six cases of lightning were reported throughout the year. Three in June, two in July, and one in August. The species struck were:

White oak,	2
White pine,	1
Hemlock,	3
	<hr/>
	6

No fires resulted from any of the bolts.

In 1913, 11 trees were struck and shattered. The months of frequency were as follows:

June,	6
July,	5
	<hr/>
	11

The species struck were:

Red oak,	2
Sugar maple,	1
Pitch pine,	3
Cherry,	1
Chestnut,	2
White pine,	2
	<hr/>
	11

So far as known, no trees were ignited by the bolts.

46. THE WHITE DEER FOREST, McCALL DIVISION.

Forester, Raymond B. Winter, Mifflinburg.

Forest Rangers:

S. M. Roadarmel, Mifflinburg, R. D. No. 2.

L. M. Stover, Livonia.

This division is located in Miles township, Centre county, and in Hartley, Lewis, West Buffalo, and White Deer townships, Union county.

The boundary survey of this division is not yet completed, owing to the purchase of additional tracts. Some interior private holdings are not yet run out. Corners where known are well marked. The present area of the division is 22,500 acres.

A few small areas contain hypermature trees, but these are limited to the rough, steep surfaces and cannot be lumbered at a profit. The area having a stand of 50 per cent. or over is 15,400 acres. 15,000 acres of this area are not in need of improvement. The area having a density of less than 50 per cent. is 2,000 acres. Scrub oak covers 5,000 acres. Probably not more than 100 acres may be planted at this time with profit.

There are a number of interior tracts, some of which are likely to be added to the State's holding. In order to protect State land, it is necessary to protect the interior tracts as well. The division lies between two other forest divisions, Buffalo and Tea Spring, consequently there is little difficulty arising from exterior tracts in private holding. The acquisition of a number of these tracts will simplify the matter of management and make the division less expensive to protect and control.

Springs and Streams.

A few of the permanent springs have been cleaned and made accessible, named and posted. Camp sites are located near them. No measurement of spring flow has been made. A number of them fail during drought. The removal of timber and the burning of humus is responsible for the failure. The streams vary with the precipitation. There is almost no contamination. The borough of Mifflinburg procures its water supply from the branch.

Buildings and Repairs.

This forest contains buildings at two camps, but are of little value. A new camp was established during 1913 for the convenience of the forest force, and includes a shelter for horses.

The Bell Telephone line is extended to the Forest House. Ranger Stover is equipped with the United telephone. Service is good at \$1.50 per month. Permanent forest headquarters are a necessity.

Roads.

Total mileage of road at present opened and usable is 33 miles; trails, 7 miles; fire lanes, 8 miles.

During 1913, roads, trails, and fire lines were improved for a distance of 46.4 miles.

Easements.

The lines of the Bell Telephone Company have been extended to Forest House. The charge for a telephone at present is \$18.00 per year. Some private telephone lines are in prospect. A pipe line crosses the eastern end of the division. Its presence is a benefit from the point of view of fire protection.

Seed Collection.

During the year 1912, about two bushels of hemlock cones were collected and retained for use on the division.

Plantations.

During 1912, 4,700 red oak seedlings were planted, covering 2 acres. One acre was planted with seed and 1½ with cuttings.

In 1913 the following seeds and trees were planted into the forest

Norway spruce, 1-1 year,	1,500
Pitch pine, 1-1year,	400
White pine, 1-1 year,	1,500
Scotch pine, 1-1 year,	200
	<hr/>
	3,600

Seed in plantation as follows:

Norway spruce,	1 pound
Pitch pine,	2 pounds
Hemlock,	3 pounds

Seed in nursery:

European larch,	1 pound
Norway spruce,	1 pound

To date 5 acres have been planted with seedlings in experimental work and the same area with seeds used experimentally. The quantity of seed planted to date is as follows:

Hemlock,	3 pounds
Pitch pine,	3 pounds
Norway spruce,	1½ pounds
Scotch pine,	1 pound
Douglas fir,	½ pound
Red oak,	1 peck
Sugar maple,	3 pounds

The planting of seedlings to date is as follows:

White pine,	11,500
Norway spruce,	1,500
Pitch pine,	400
Scotch pine,	200
Red oak,	4,700
	<hr/>
	18,300

Sample Plots.

A number of plantations have been made, the last during 1912, when one-half acre was sown with Scotch pine seed, the land having been burned over. What rubbish and other material remained on it were cleared off and the soil scratched. This has proved a success. Seed sown in the sample plots during the year included:

Norway spruce,	½ pound
White pine,	1 pound
Scotch pine,	1 pound
Douglas fir,	½ pound

Nurseries.

The small nursery area for experimental purposes covers 700 square feet. At the end of the 1913 season it contained the following seedlings:

Norway spruce, 1-year,	8,000
European larch, 1-year,	400
	<hr/>
	8,400

Seedlings to the number of 1,600 were taken from the nursery in the spring of the current year and planted within this forest. The nursery is simply for experimental purposes and is not capable of enlargement.

Labor.

Labor in this region costs 15 cents per hour or \$1.50 per day. Team with driver may be had for from \$3.00 to \$3.50 per day. Laboring men are hard to get because of farm work and berry picking. The quality of the labor in this region is fair, but it must be supervised constantly.

Improvement Cutting.

A small improvement was started at the Halfway bridge, a narrow strip between Brush Valley road and Rapid Run. This was in a fire-killed area. After cleaning up it was planted with conifers, which are growing satisfactorily. Little improvement cutting has thus far been accomplished except at a dangerous place in the Brush Valley Narrows.

Markets.

The local markets call for building material. Mifflinburg is a center for manufacturing carriages. The forest products are from 6 to 18 miles from the Pennsylvania railroad. The cost for delivery is too great. The local market will probably be small for many years to come. There is at present little sale for cord wood.

Erosion.

Little erosion is in evidence on this division except in the old trail roads. The rapid restoration of the growth cover after a fire prevents washing.

Insects and Fungi.

The chestnut blight fungus has appeared and is doing some damage at two places, one near the McCall property and the other on the southeastern side of Buffalo mountain. Oyster shell scale is present on soft woods, and the bark beetle is working in the large hemlocks.

Forest Fires.

The greatest danger on this division from fires arises from incendiarism and carelessness. The people still seem to think they must burn the mountains to produce a crop of huckleberries. During the year there were but two fires on this forest and the area burned over was about 200 acres. The damage was slight. Cause of both is believed to be carelessness of travelers and hunters. In some places the burn-

ing was to the mineral soil; in others only the top layer was scorched. The bare tops of Buffalo and Sand mountains are high enough to be used for lookout stations at present. A small tower on each would be of great benefit. Fire roads lead to both places.

Two fires on State land during 1913 covered 1,500 acres and were intentionally started, from best evidence at hand.

Outing and Recreation.

This region is much sought after for hunting, fishing, and general recreation. The people of Buffalo Valley enjoy it to the full. A number of permanent private camps exist. During fishing, berrying, chestnut, and mountain tea seasons the forest is frequented by large numbers of persons. Their conduct is generally good, but there are some exceptions. It will take time to bring them to see that they must use the forest in a changed manner. During the 1912 deer season there were 10 camps on State land and 10 on private land. At least 250 men and boys engaged in hunting. 24 deer were reported killed, and 2 bears. One of these was brown. Small game was abundant and good bags were secured.

Twenty-seven permits were issued to 145 persons in 1913. 20 deer were taken and 300 men hunted on the division during the open season. A large number of pheasants, rabbits, squirrels, and raccoons were likewise killed.

All camp sites in this division will be numbered from 5,001 to 5,099 inclusive.

Fishing is good in all the streams. The best streams are stocked every year. The likelihood is they will be overfished and the stock depleted. There are at least 25 good camp sites within the division.

Lightning Report.

The period of greatest frequency of lightning was during the month of August. The trees struck and shattered were:

Scarlet oak,	2
Chestnut,	5
White oak,	2
Pitch pine,	7
	<hr/>
	16

Five of the pitch pines struck were dead. None of the trees was ignited so far as known.

The following trees were struck and shattered in 1913:

Pitch pine,	5
White pine,	1
Hemlock,	2
Chestnut,	5
Rock oak,	4
Red oak,	1
Scarlet oak,	1
	<hr/>
	19

One white pine was struck and ignited. This tree was entirely consumed.

47. THE WHITE DEER FOREST, TEA SPRING DIVISION.

Forester, Homer S. Metzger, Loganton.

Forest Rangers:

D. R. Harbeson, White Deer.

Harry H. Kiel, Loganton, R. D. No. 1.

This division lies in the eastern portion of Centre county, southeastern portion of Clinton county, and the western end of Union county. The forest headquarters are located at Eastville.

The division contains approximately 26,000 acres, lying between Sugar Valley narrows and Brush Valley narrows. The boundary survey is complete except on the north line of a warrant and the west line of another, these being late purchases. All surveyed lines are blazed and posted. Two miles have been brushed out to serve as a fire lane. Large stone monuments are built at each corner. No additions were made to the division during 1913.

Mature and hypermature trees were found scattered about but there is no area which may be said to be covered with this class of forest. These old trees are scattered over an area of 1,000 acres or more in rough places, are distant from the railroad, and will not make good lumber. Possibly 100,000 feet of this second grade material might be found. A density of 50 per cent. or over is found on approximately 18,000 acres. 15,000 acres of this area will need no improvement cutting at this time. 3,000 acres would be helped by some cutting, but the pro-

duct would be inferior material with no market calling for it. The product would amount to about $1\frac{1}{2}$ cords per acre. High freight rates would cause a loss in handling. With protection natural regeneration will strengthen the area very considerably. That portion having a density of from 10 per cent. to 50 per cent. will reach approximately 6,000 acres. A few scattered old rock oaks and hemlocks are found here and should be removed. Natural regeneration of good young material is in evidence and satisfactory growth will result with proper protection. The brushy growth will cover 1,000 acres. Natural regeneration will ultimately reclaim it, but slowly. Some fire-killed material on it might produce 1,500 cords. The area which can be planted at this time with little difficulty and without preparation of the ground does not exceed 5 acres. There are many rocky points and ledges where only a sparse tree growth is found. The old stumps show that trees once grew there. Upon 200 acres of such area may be expected only partial natural regeneration. Streams cover 40 acres; roads and trails 80 acres; fire lanes, 30 acres.

Springs and Streams.

All located springs have been cleaned and cleared and trails opened to them. Nearly all are posted. The larger springs flow throughout the year. Few are dry in summer. Humus conditions are not good and the springs were not known to go dry while the surrounding mountains were well timbered. Stream flow is regular throughout the year except Crabapple Run, which dwindles to a thread. The waters are without danger of contamination.

Buildings and Repairs.

New buildings have been erected, one set at Eastville for the forester's headquarters, and one at Tea Spring for the ranger. The necessary additional out-buildings and fences have been added and all are now in good repair.

Roads.

The development of a system of roads, trails, and fire lanes was the main feature of the work during 1912. Two miles of new road were built. This serves also as a good fire lane and gives ready access to the interior of the forest. The remaining work consisted of improving the old roads by correcting grades, removing stones, and in the development of fire lanes and trails. The principal part of the work was done by the forester and his rangers. The total mileage of roads within this division is 40 miles; trails, 10 miles; fire lanes, 6 miles.

During 1913, 51 miles of road were repaired and $1\frac{1}{2}$ miles of new road were built. The McCall dam road was improved for a distance of 4 miles. The grades were lowered and large stones removed. Gravel was used for surfacing. One new bridge was built. Fire lanes were opened for 16 miles and all logs and brush taken out. A narrow path of bare soil was exposed in the interior. 6 miles of trails were brushed and improved.

Easements.

The White Deer and Loganton Railroad Company has a right of way through this division. This existed prior to the purchase by the State. The presence of the railroad increases the fire danger but it will be a useful adjunct to take material to the market in the future.

Seed Collection.

A small quantity of seed was collected in 1913 amounting to a bushel each of red oak, white oak, and rock oak. The seeds were low in quality. The year was known as a poor seed year.

Plantations.

During 1912, 5,000 seedlings of the American elm were planted, at least 95 per cent. of which are in healthy condition. The area planted covered about 3 acres. Seed sown in sample plots covered about half an acre.

During the year 1913 the following seedlings were planted:

Norway spruce, 2-year,	2,000
Scotch pine, 2-year,	2,000
White pine, 1-1 year,	5,000
	<hr/>
	9,000

The following trees have been planted to date:

Scotch pine,	2,000
White pine,	15,000
Norway spruce,	2,000
American elm,	15,000
Cuttings,	1,000
	<hr/>
Total,	35,000

Sample Plot.

An experimental plot of Norway spruce and white pine in mixture was planted at the Black Gap plantation on 3 acres. The ground was covered with heavy growth of ferns and weed trees. The experiment is to see which of the species will make the better growth under the above conditions.

Labor.

Labor in the region costs 15 cents per hour. For a team the price is 30 cents per hour with or without driver. The labor is scarce. Nearly all have small holdings of their own and they give them the first attention. The people prefer steady employment and this is not to be had within the State Forest.

Markets.

The only local demand is for a small amount of fire wood. Building material ranges in price from \$18.00 to \$24.00 per thousand according to size and quality. Cord wood sales are made at a price ranging from 15 cents to 25 cents per cord, according to kind and difficulty or ease in procuring it. The nearest market for the above material is 17 miles. The rates are too high to allow shipment of inferior material.

Erosion.

The division is so well stocked with growth of some kind that no erosion is taking place.

Insects and Fungi.

The chestnut bark disease has been noticed in a few trees. Wherever found it has been cut out and destroyed.

Forest Fires.

During 1912 there were no forest fires on State land. Two fires occurred nearby on private land, both of which were fought by the forest force.

No fires occurred in 1913 during the fall of the year. The three occurring on State land were in the spring and all indications point to the fact that they were intentionally set. Four other fires burned on nearby private land. State land was burned to an aggregate area of 3,050 acres. One observatory tower was built on what is known as First Mountain. A fire lane was brushed over Tea Knob, This

being the highest point on the division, likewise serves as an observatory station. Fire wardens in the neighborhood were prompt in attending to their duties.

Outing and Recreation.

The region is much sought for by hunters and fishermen. During the 1912 hunting season 28 camping permits were issued for this division and about 100 additional men hunted without camping. These board in the valley with the farmers. Hunting and fishing become more popular each year and more people are brought directly into contact with forest work. The rules governing the use of the forest are very carefully observed. 17 deer were reported taken during the season. Small game is abundant and appears to be increasing.

Twenty-four permits were granted into the division during the 1913 hunting season. About 100 other persons hunted on State land. The conduct of all hunters was entirely satisfactory. Fourteen deer and 2 bears were killed on the division during the season. Large numbers of pheasants, rabbits, grey squirrels, were taken. Two catamounts were killed. Brook trout are abundant in White Deer Creek and fishing is good. 22 camp sites have been located and marked. All camps within this division will be numbered consecutively from 5,101 to 5,199 inclusive.

Lightning Report.

In the locality, not confined alone to State land, 8 trees were struck by lightning during the season. The period of greatest frequency was the month of May. The species struck were:

Chestnut,	4
Hemlock,	2
Hickory,	2

No trees were ignited so far as known.

During 1913, 11 trees were struck and shattered by lightning. The period of frequency was as follows:

June,	1
July,	3
August,	6
September,	1

11

The species struck were as follows:

Chestnut,	5
Hemlock,	3
Rock oak,	2
Red maple,	1
	<hr/>
	11

So far as known, none of these trees struck were ignited.

48. THE YOUNG WOMAN'S CREEK FOREST.

Forester, Walter M. Mumma, North Bend.

Forest Ranger, F. P. Miller,* North Bend.

The Young Woman's Creek Forest is situate in Chapman township, Clinton county, almost entirely on the waters of the creek bearing the same name. A small portion of the forest extends eastward into the divide of Hyner Run, and a part westward into Paddy Run. The latter lands adjoin the State Forest in Leidy township. The forest is bordered on the north by the Black Forest and Kettle Creek Forest in Lycoming and Potter counties respectively.

The forester was assigned to this region September 1, 1912, and in the short time he has been in charge it has not been possible to accomplish much in the way of permanent improvement. Because of the unsurveyed boundaries and the disappearance of line trees and other marks, it is somewhat difficult to locate the exact lines. They have been determined approximately and proper notices posted. This land is a solid block with the exception of a single interior tract. The lumbering of the whole area was complete, followed by the usual forest fires. The best growth was in the southern portion. The second growth hardwood has to date produced some merchantable material. There is a scattered regeneration of hemlocks and some hyper-mature hardwoods over the steep slopes. A fine second growth of white pine, of small area, is at the head of Stout Hollow. With fires kept out the brush soon reaches large size and the promise for regeneration naturally is good. The hills are steep and washed rather bare of soil. Regeneration of any kind will be difficult in these places.

*Left service May 15, 1913.

Geological Formation.

Nearly all the land in the township is included in the Karthaus-Renovo coal basin, but the workable coal beds are few in number. These exist mostly along the river hills and hence the probability of coal under the State land is remote. At Renovo several beds are caught in the deepest portion of the basin, but these have not proved valuable. Northeast of this locality the axis rises so that in the country between Paddy's Run and the Coudersport pike, the available coal land is in isolated portions.

The rocks of the region are all of the sub-carboniferous period. The conglomerate predominates, with occasional outcroppings of the red shale. Beneath these come the Pocono sandstone, found mostly in the ravines.

Valuable deposits of fire clay have been discovered on adjoining lands but so far no signs of mineral wealth have been discovered on the State property.

The highlands near the Potter county line show slight evidences of glacial action, such as groovings, terraces, and moraines. North of the line the action of the Potter county glaciers is more visible.

Topography.

The forest is cut into three large divisions by the two main branches of Young Woman's Creek. To the west is the large area between the West Branch and the divide of Paddy's Run. This is further divided by four streams running in a general northwesterly direction, Mud Lick, Stout Hollow, Shingle Branch, and Greenlick. Between the East and West branches of the creek is a large territory known as the Fork Hill. The top of this hill is a large rolling plateau extending from the forks of the creek to the divide between the West Branch of the Susquehanna and Pine creek. The only ravines in the Fork Hill of any size are found on the eastern side. These are Summerson Run, McCraney, Bull Run, and the Lebo. On the western side there are several small hollows which rise rather abruptly.

To the east of the East Branch there is another large plateau extending in that direction to the Hyner divide. This is also cut into smaller portions by several streams, Lorillily Fork, Shaney Brook, John Quiggle Run, Stone Chimney Hollow, Six Mile Hollow, and Seven Mile runs.

The side hills are very steep and rocky, especially for ten or twelve miles up the creek. Then the country gradually broadens out to the head of the stream. The large plateaus on top usually have a good

sandy soil, which, previous to the destructive fires, was of a loamy nature.

While this land is fair for farming, the untimely frosts would make agriculture hazardous. The region near the head of the creek has frost nearly every month in the year, while down in the valley there are usually three months without frost. The precipitation is normal. During the past summer (1913) there occurred a severe drought during the month of August. All the smaller streams were dried up.

Springs and Streams.

There is an abundance of water, with springs at the head of every little hollow. The plateau region is dry and springs are few in number. All have been improved and paths opened to them. Protracted drought causes many to fail. Stream flow is variable. Absence of humus is largely responsible.

Buildings and Repairs.

The only building of any consequence is the old Howard and Perley cottage at the mouth of Greenlick Run. It has been slowly falling into a dilapidated condition, but a few repairs would make it an ideal station for a ranger.

Roads.

The main roads are the old mountain trails along the branches of Young Woman's Creek. Some of them are in good condition although they have not had work done upon them for years. These roads have been brushed and the stones removed. 100 feet of cribbing was built where there was danger of the creek cutting out the road. The slopes are too steep, and the grades require lessening. The total mileage of open road capable of being traveled is 6 miles. A local movement is on hand to open the main Young Woman's Creek road through to the Coudersport pike. The road along the right hand branch of the creek is in bad condition. It is located on low areas and is too wet. Brushing a little more than the ordinary width would assist in drying it. The local gun clubs are always ready to lend a hand in putting roads into better condition. These two roads form the basis of the fire protection system and the series of roads and trails to be worked out will be based upon them. An old railroad grade running for a distance of 10 miles along the Shingle Branch may be made into a good road and will connect this forest with the Kettle Creek forest. The other old mountain roads will make suitable fire lines.

In 1913, road work was carried on where most needed. All the roads need improvement. Upwards of 20 miles were covered on 7 of the more important roads, the repairs being brushing, scraping, and draining.

Minerals.

It is believed that large portions of this forest are underlaid with fire clay deposits, although none has actually been disclosed. There is fire clay on adjoining lands and the formations are much alike. Valuable revenue for the State is a possible promise from this source.

Leases.

A small amount of timber cutting has been made by A. J. Gotshall on Mud Lick Run and Dark Hollow. All such material that ought to be taken out now for the betterment of the forest is being removed.

Plantations.

Planting during 1913 was done at the Reiker farm. The following seedlings were used:

Red pine, 2-year,	10,000
White pine, 1-1year,	13,400
Norway spruce, 2-year,	8,600
	<hr/>
	32,000

Labor.

Labor costs from \$1.75 to \$2.00 per day and men are difficult to get. Only those may be had who are not desirous of steady employment. Team hire costs \$4.50 per day with driver. The local brick yards, the tannery, and the nearby railroad shops at Renovo offer steady work with high wages, and at present the forest is not able to compete with them.

Markets.

The jack pine is called for from the hard coal fields. The mines will take almost any kind of good hardwood. Locust of 5 inches in diameter upward in cord wood lengths is used for insulator pins. The paper mill at Lock Haven will take paper wood, paying for jack pine from \$7.00 to \$8.00 per cord. Dead chestnut is about the only timber that should be removed at present from this forest. It cannot be sold at a profit.

Insects and Fungi.

There is no serious fungous attack. The chestnut bark disease is not found. The locust borer is prevalent and damages both small and large trees.

Forest Fires.

Hunters and fishermen all express a willingness to assist in preventing fire. Because of the inaccessibility of large parts of this forest, a hard fire would be difficult to fight.

Fires were prevalent in 1913 and because of the dryness they burned rapidly over the surface. The spring fires and the trout fishing seasons are coincident. Brick yard tram engines and lumber operations cause some fires. 7 fires during the year were fought by the forester, two wholly on State land, 3 wholly on private land, and 2 on both State and private land. The area of State land burned was 3,000 acres. The earlier fires were not so destructive. The main problem in this forest is the prevention and suppression of fires. There is a better attitude on the part of the residents toward the fire problem.

Outing and Recreation.

There is an abundance of fish and game in this region and it is much sought after by sportsmen. Several hundred hunters have availed themselves of the opportunity. At least 400 hunters went into the woods from Hyner and most of them went upon State land.

Twenty-four permits were issued in 1913 into this forest. Hundreds of persons used it for the day only. Trout streams are well stocked. There is no pollution.

Permanent camps in this forest will be numbered from 5,201 to 5,299 inclusive. 7 permanent camping sites have thus far been cleared.

49. THE STATE FOREST ACADEMY, 1912.

E. A. Ziegler, Director.

Buildings and Grounds.

The buildings received some needed repairs and a bath room was added for kitchen employees. The old ice house was no longer usable and a new one was constructed in a better location.

The students surveyed and laid an 8-inch open joint terra cotta drain for a distance of 600 feet. This was necessary for the proper draining of the Academy grounds. It carries off the rain in wet weather satisfactorily and takes care of the seepage from the stream. They leveled the lower campus making a cut and fill, and improved the condition of the grounds. A new cess pool has for the present at least solved the sewage disposal question. The road to the stable has been changed and improved.

Library.

Additions to the library have been made by the purchase of 23 volumes and the gift of 69 volumes by the friends of forestry. 54 volumes were presented by the Pennsylvania Forestry Association. The books were gladly received. At present the library is deficient in history, biography, poetry, travel, and fiction. The students support a periodical club with the help of the faculty and a member of the Forestry Commission.

Equipment.

The herbarium case has been installed and a platform for the collection of Pennsylvania woods is about to be erected. The collection of photographs and lantern slides in zoology, botany, and wood technology has been enlarged.

Instruction.

Prof. Worthley left the teaching force, accepting a position with the Pennsylvania Railroad forestry staff. Mr. Retan, a graduate of the Academy, has succeeded him in silviculture, and has also assumed charge of the nursery in place of Mr. Bietsch. This arrangement makes for economy in the teaching force and the instruction has pro-

ceeded satisfactorily. The stock map of the Mont Alto division is complete and was finished before the retirement of Prof. Worthley. Meteorological observations were interrupted but have since been resumed. The curriculum as corrected for the year 1913 is found attached hereto.

Student Body.

Because of deficiency in studies, three members of the third year class resigned. One who had failed in one branch only was reinstated January 1, 1913, and will follow with the next class. The class which entered September, 1912, contains no men from the farm or forest, and in this respect is not an improvement over former classes. However, the test of the new entrance requirements is scarcely complete so that proper conclusions may not be drawn.

Labor.

A part of the course at the Academy is the labor requirement from the student body. This they do in addition to their field instruction work. Their labor is supervised by instructors and correct forestry practice is maintained. Their record for labor is as follows:

Fire fighting and patrol,	1,049 hours
Tree planting,	1,181 hours
Nursery work,	1,015 hours
Wood cutting (forest thinning and improvement),	1,964 hours
Logging and mill work,	1,233 hours
Campus grading and drain,	3,253 hours
Campus upkeep and minor improvements,	1,127 hours
Surveying, topographic map,	3,105 hours
Stock map,	2,492 hours
Miscellaneous,	540 hours
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	16,959 hours

The above is equivalent to 67 9-hour days per student, and shows 30 per cent. more labor than was performed in 1911.

Lectures.

To relieve what may seem to become a monotony in Academy life, lecturers were invited occasionally for the entertainment of the

students. During the year lectures were given by the following persons:

J. Horace McFarland, Harrisburg,

"See Pennsylvania First."

Hon. S. B. Elliott, Member of the State Forestry Reservation Commission, Reynoldsville,

"The March of Forest Devastation in Pennsylvania."

Miss Mira L. Dock, Fayetteville,

"The Forest Reservation Commission."

At intervals members of the faculty discussed forestry subjects.

THE STATE FORESTRY ACADEMY, 1913.

Buildings and Grounds.

The year just closed has been the first one since 1908 during which no new buildings or extensive campus improvements have been under way. The school is comfortably housed and the school work consequently more effective. Necessary improvements now are limited to equipment such as the much-needed cases for the dendrology, entomology, and pathology collections which are rapidly increasing in size.

A stone-arch foot bridge made of native sandstone and surmounted with metal railings was built during the year across the stream in front of Wiestling Hall. This bridge replaces an old unguarded wooden bridge and is a notable improvement to the campus from both the aesthetic and utilitarian points of view. A concrete walk was also built from this bridge up to Wiestling Hall.

An excellent stone retaining wall was erected in the rear of Main Hall.

A portion of the campus roads were top-dressed with crushed limestone.

Library.

Additions to the library have been made as follows: Purchase, 30 volumes; presented, 10 volumes; pamphlet publications bound, 44 volumes. A complete set of index cards for the forestry publications of the United States Department of Agriculture was added to the card catalogue.

The periodical club was again maintained by the students and instructors.

Equipment.

There was little equipment added during the year. The school is now well equipped with laboratory and class room apparatus. In a forest school, however, the "natural sciences" must necessarily receive much attention and any effective and progressive instructor will soon be accumulating a working collection, at least, of specimens for class instruction. The Forest Academy has reached this stage and it is of the greatest importance that proper receptacles and cases be at once provided for the various collections. It is very discouraging for an instructor to spend valuable time and much effort in mounting dendrology specimens, or collecting fungi or insects of economic importance in the forest, only to see the specimens ruined and the work lost for want of proper receptacles and cases for their preservation.

Tenth Anniversary Commencement.

In August, 1913, the Pennsylvania State Forest Academy celebrated the 10th Anniversary of its establishment. The field meeting of the State Foresters was held on the Caledonia and Mont Alto State Forests on August 12 and 13, which permitted the Academy graduates to attend the commencement exercises on the 14th. Many of the foresters were back for the first time since their graduation and the progress in the school and the improvement of the adjacent State Forests were much remarked.

Prof. Filibert Roth, Dean of the Forestry Department at the University of Michigan, attended the foresters' field meeting and gave the Forest Academy Commencement address. The presence of the Commission, the Secretary of Agriculture of Pennsylvania, the President of the American Forestry Association, and the graduates made the Tenth Anniversary Commencement a memorable one.

The Commencement program follows:

EIGHTH GRADUATING EXERCISE PROGRAM.

- Music,Orchestra.
- Invocation.
- Salutatory,George Sargent Perry.
- Music,Orchestra.

Address,Prof. Filibert Roth,
Dean of the School of Forestry, University of Michigan.

Music,Orchestra.

Greetings.

Presentation of Diplomas,Edwin A. Ziegler, A. M.,
Director, State Forest Academy.

Music,Orchestra.

Valedictory,William Erdmann Montgomery.

EIGHTH GRADUATING CLASS.

Class of 1913.

Valentine Mathias Bearer,	Benedict Bryson McCool,
Horace Fieldhouse Critchley,	William Erdmann Montgomery,
John Rutherford Elder,	Max Ernst Müller,
Thomas Henry Golden,	Robert Roland Neefe,
Jesse Meredith Houtz,	George Sargent Perry,
Charles Edgar Zerby.	

Eleven men composed the graduating class and the State is to be congratulated in the addition of these men to its force of trained foresters. The proportion of the class with high scholarship and at the same time great proficiency in the practical end of the work was probably higher than usual.

A tenth anniversary illustrated booklet was issued, fully setting forth the purpose of the school and describing its courses. As a result of the issuing of this booklet, the applicants for entrance to the school are increasing. This must further raise the standard of the entering classes which has already been pronounced generally above that of the average class entering our colleges.

Curriculum.

Few changes were made in the course of studies. A card system of forest accounts is now being given in the book keeping course along with the usual instruction in business forms and procedure. A series of instructional talks has been arranged for covering the use of Department Forms and the making of the required foresters' reports.

A copy of the 1913 curriculum is appended.

Scholarship.

The new class of eleven men entering in September appears to have had a fair preparation in the elementary and college preparatory subjects. The proportion having had farm or forest training (while larger than in the previous class) might be advantageously increased.

It was necessary to recommend the resignation of four men out of the class of eight at the close of their first year's work. Three were unable to pass their final examinations largely on account of deficient preparatory work, and the fourth was entirely unable to attain the forester's view point or gain satisfactory proficiency in the practical parts of the course.

LABOR OF STUDENTS OUTSIDE OF PURELY CLASS AND INSTRUCTIONAL WORK.

	*1910	1911	1912	1913
Tree planting,		2,139	1,181	4,152
Fire fighting,		914	1,049	2,003
Nursery work,		899	1,015	2,287
Improvement cutting,		780	1,984	902
Road building,		832		
Campus (including garden and orchard),		452	4,380	1,835
Work on Reserve Map (field and drafting),		1,342	3,105	2,991
Stock map,		1,510	2,492	
Telephone line,				527
Miscellaneous,†		2,475	1,773	2,017
Total,	14,223	12,643	16,959	16,714

*Report for 1910 not given by items.
†Includes setting up and work on sawmill, cutting fire line, mounting specimens for school collection, making charts for school, etc.

In 1913, the labor performed is equal to 65 9-hour days per man for each of 29 men. Of this 16 days were tree planting, 8 days fire fighting, 9 days nursery work, 4 days improvement cutting, 7 days campus, 11 days reserve map, 2 days telephone line and 8 days miscellaneous work. Some of the work, as improvement cutting, reserve mapping and telephone construction was done entirely by one class so that the days per man in the class on such work was probably three times that given above and the training value correspondingly larger.

The Pennsylvania State Forest Academy has the finest location for the study of forestry in the forest of any school in the country. It must not be overlooked that this is a 48-week school year and that the same amount of work is here covered in 3 years that is covered in other schools in 4 years (36 weeks each). It is becoming well

established and is furnishing the State with well-trained foresters. It is doing original work. It would seem very desirable that the United States Department of Agriculture should establish a system of Forest Experiment Stations throughout the country similar to the Agricultural Experiment Station System, where forest research would be carried on in a much less desultory manner and with less chance of useless repetition. The Pennsylvania Forest Experiment Station should be located on the Mont Alto State Forest. This is the most advanced State Forest in point of development in Pennsylvania and the educational value of such a station here would be of great importance to the school.

COURSE OF STUDIES AT THE ACADEMY.

FIRST YEAR.

First Term.

	Hours.
Botany I,	6
Physics,	4
English,	3
Elementary Forestry,	5
Business Law and Bookkeeping,	3
German I,	3
Chemistry I,	2

Second Term.

Botany II,	6
Chemistry I,	6
English,	3
Meteorology and Forest Influences,	4
German I,	3
Trigonometry,	4
Physics,	2

SUMMER TERM.

Nursery Practice, Improvement Cuttings, Botany III.

SECOND YEAR.**First Term.**

Dendrology,	5
Wood Technology and Timber Physics,	5
Botany IV,	6
Chemistry II,	6
Geology,	4
Scientific German II,	3

Second Term.

Forest Utilization,	5
Silviculture,	6
Dendrology,	2
Zoology,	6
Soils,	5
Scientific German II,	3
Plant Chemistry,	2

SUMMER TERM.**Forest Mensuration.****THIRD YEAR.****First Term.**

Forest Finance,	3
Forest Protection,	6
Surveying,	8
Forest Management,	3
Economics, General,	5

Second Term.

Forest Economics and Policy,	3
Surveying,	8
Roads,	2
Forest Management (Working Plan),	4
Dendro-Pathology,	2
Mechanics—Telephone construction, etc,	1
Forest Entomology,	2
Forest History,	1

SUMMER TERM.**Topographic Surveying and Thesis.**

TABULATED STATEMENT, BY COUNTIES, OF LOSSES FROM FOREST FIRES, FOR THE YEAR, 1912.

	Number of acres burned over.	Number of feet (board measure) of logs burned.	Number of feet (board measure) of sawed lumber burned.	Number of railroad ties burned.	Number of mine props burned.	Number of cords of pulp wood burned.	Number of cords of cord wood burned.	Number of cords of bark burned.	Number of panels of fence burned.	Number of buildings burned.	Value of buildings burned.	Cost to individuals to extinguish fires.	Number of men employed by individuals.	Number of days employed.	Total loss by reason of forest fires.	Number of fires.
Adams,	200											\$5,478	20	20	\$556 50	1
Ballard,	1,357					28						3,350	25	25	2,126 00	6
Blair,	800				500							96,875	125	425	1,876 50	2
Bradford,	115	6,000										96,875	125	452	1,083 75	2
Cameron,	1,000											6,060	28	28	860 80	2
Carbon,	1,367				65							19,338	25	107	1,522 50	6
Centre,	4,903	20,000							375			2,440	16	14	11,260 50	11
Chester,	8														70 00	2
Clearfield,	3,526								160			11,875	46	56	17,545 00	9
Clinton,	1,988	2,000							80			5,470	32	31	1,519 00	5
Columbia,	47								41			1,150	12	8	581 00	3
Cumberland,	698		400				36		200			14,300	55	97	3,625 00	16
Douglas,	69				100		4		235			98,575	128	433	1,613 75	3
Elk,	153								29			4,650	26	31	2,272 00	3
Payette,	50				200			10	156			8,478	53	38	2,872 50	14
Franklin,	1,567								25			2,300	88	133	4,598 00	14
Fulton,	4,824								80			6,375	34	34	2,303 00	6
Huntingdon,	2,050								170			2,450	7	13	210 00	3
Lackawanna,	133						2					715	7	5	128 00	4
Lafayette,	23														207 00	1
Lehigh,	49														2,686 00	9
Luzerne,	1,457											9,325	65	59	5,989 55	17
Lycoming,	1,679	6,000					11		75			127,905	221	629	7,225 00	3
Mifflin,	47											1,200	6	6	284 00	4
Monroe,	1,600	50,000		4,000	3,000		300					2,500	10	12	10 00	1
Montour,	2														2,325 00	5
Northampton,	147								10			2,040	5	10	122 00	2
Northumberland,	5								25			3,825	11	17	1,628 00	16
Perry,	246								143	1	\$500 00	1,300	9	9	2,900 00	3
Pike,	9,075				120				160			10,129	43	47		

Owner	Acres	Value	Assessment	Exemption	Net Value	Rate	Amount	County
Potter,	154							154
Schuykill,	4,188							4,188
Snyder,	175							175
Somerset,	160							160
Sullivan,	100							100
Susquehanna,	30							30
Tioga,	305							305
Union,	39							39
Wayne,	4							4
Westmoreland,	230							230
Wyoming,	2,078							2,078
York,	37							37
Total	39,810	106,000	400					39,810
Acres burned over and loss sustained to State lands included in above,	8,680	2,000						8,680
Total	48,490	108,000	400					48,490

NUMBER AND CAUSES OF FIRES DURING 1912.

Unknown,	107
Railroads,	82
Hunters and fishermen,	19
Incendiary,	16
Burning brush,	13
Carelessness,	8
Smoking out squirrels,	7
Sawmills,	5
Traction engines,	3
Lightning,	2
Burning barn,	1
Total,	213

TABULATED STATEMENT OF TIMBER CUT IN PENNSYLVANIA IN 1912.

Counties.	Number of acres cut over.	Number of acres cut over to be used for farming pur- poses.	Number of feet (board meas- ure) white pine cut.	Number of feet (board meas- ure) yellow or other pine cut.	Number of feet (board meas- ure) hemlock cut.	Number of feet (board meas- ure) oak cut.	Number of feet (board meas- ure) chestnut cut.
Adams,	748	54	460,150	10,120	161,000	790,575	342,240
Allegheny,	147	25	80,000	.....	15,000	712,900	16,054
Armstrong,	235	40	.....	.....	.....	1,000,000	240,000
Beaver,	125	.....	.....	.....	.....	1,399,400	5,000
Bedford,	900	185	170,000	185,735	16,000	1,591,000	798,670
Berks,	112	10	3,000	1,000	.....	40,000	108,000
Blair,	4,685	72	77,000	20,000	227,000	1,091,000	594,500
Bradford,	608	100	640,900	46,500	1,723,000	195,000	114,000
Bucks,	319	220	.....	.....	2,000	50,000	1,003,000
Butler,	263	53	.....	.....	.....	965,000	670,000
Cambria,	1,755	165	41,000	.....	1,482,976	189,577	341,506
Cameron,	1,450	.....	62,166	.....	1,676,043	.....	23,376
Carbon,	202	2	80,000	.....	.....	.....	.....
Centre,	16,927	355	2,017,325	354,173	976,750	3,468,562	2,382,542
Chester,	352	.....	.....	.....	.....	100,000	.....
Clarion,	587	13	190,000	.....	8,000	2,302,976	1,233,943
Clearfield,	6,417	224	1,908,000	549,000	1,739,000	948,500	504,500
Clinton,	4,120	161	905,945	619,892	1,897,000	992,347	404,245
Columbia,	279	45	45,000	3,000	7,000	108,000	67,000
Crawford,	508	214	713,000	.....	421,500	531,100	118,000
Cumberland,	340	32	700,000	259,000	20,000	410,000	65,000
Dauphin,	867	50	185,844	155,000	182,637	1,102,449	906,275
Delaware, .....	.....	.....	.....	.....	.....	.....	.....
Elk,	6,651	217	626,000	165,000	51,867,235	618,000	563,000
Erie,	284	237	175,864	.....	1,046,739	357,588	308,032
Fayette,	1,581	621	.....	.....	.....	3,601,432	800,206
Forest,	2,428	.....	3,726,897	320,000	22,755,986	124,716	231,000
Franklin,	711	157	135,000	340,000	.....	2,005,000	338,000
Fulton,	767	109	1,068,000	299,500	.....	1,855,000	144,000

Greene,	100	50	.....	1,040,524	.....	1,117,977	200,000	200,000
Huntingdon,	4,386	168	.....	2,318,219	.....	4,040,667	808,970	808,970
Indiana,	146	140	.....	.....	.....	945,000	202,000	202,000
Jefferson,	747	74	.....	688,685	.....	847,202	337,216	337,216
Juniata,	1,704	8	.....	839,000	.....	1,871,066	248,000	248,000
Lackawanna,	54	.....	.....	.....	.....	.....	.....	.....
Lancaster,	380	18	.....	.....	.....	.....	655,100	655,100
Lawrence,	160	50	.....	.....	.....	.....	500,000	500,000
Lebanon,	75	.....	.....	.....	.....	.....	50,000	50,000
Lehigh,	40	.....	.....	.....	.....	.....	170,312	105,000
Luzerne,	1,465	83	.....	837,947	.....	.....	1,391,375	868,100
Lycoming,	7,543	260	.....	4,108,096	.....	4,167,421	890,644	890,644
McKean,	6,152	.....	.....	150,000	.....	49,019,500	200,000	200,000
Mercer,	370	60	.....	.....	.....	.....	801,867	501,268
Mifflin,	1,119	105	.....	366,500	.....	1,137,360	356,000	356,000
Monroe,	1,842	18	.....	1,270,120	.....	157,000	87,000	87,000
Montgomery, .....	.....	.....	.....	.....	.....	.....	.....	.....
Montour,	20	.....	.....	10,000	.....	.....	20,000	25,000
Northampton,	212	30	.....	130,014	.....	.....	339,090	360,000
Northumberland,	1,170	50	.....	633,000	.....	278,302	494,211	150,000
Perry,	1,867	53	.....	178,000	.....	133,000	1,150,000	2,077,000
Philadelphia, .....	.....	.....	.....	.....	.....	.....	.....	.....
Pike,	2,133	70	.....	728,271	.....	351,993	380,845	95,000
Potter,	19,998	1,768	.....	2,300,000	.....	50,890,708	3,464,000	4,790,000
Schuylkill,	210	.....	.....	.....	.....	.....	.....	60,000
Snyder,	806	4	.....	257,500	.....	177,620	524,700	60,000
Somerset,	2,391	102	.....	3,060,000	.....	1,575,000	5,065,833	5,510,300
Sullivan,	3,939	131	.....	20,000	.....	14,131,100	85,000	265,000
Susquehanna,	1,001	189	.....	61,296	.....	1,612,434	40,000	140,408
Tioga,	4,249	554	.....	608,500	.....	2,418,331	453,500	182,000
Union,	426	16	.....	222,886	.....	128,367	224,168	98,498
Venango,	2,505	253	.....	250,000	.....	110,000	2,046,511	488,177
Warren,	3,774	435	.....	8,024,725	.....	27,887,325	1,562,000	1,510,000
Washington,	484	289	.....	.....	.....	.....	3,806,128	63,230
Wayne,	1,751	308	.....	1,241,000	.....	1,148,000	123,000	389,000
Westmoreland,	382	.....	.....	70,000	.....	.....	455,000	531,500
Wyoming,	767	71	.....	776,000	.....	830,000	580,000	170,000
York,	431	58	.....	.....	.....	3,000	1,161,500	827,949
.....	129,342	8,836	.....	41,365,750	.....	250,773,010	61,545,497	85,594,479

TABULATED STATEMENT OF TIMBER CUT IN PENNSYLVANIA IN 1912.—Continued.

Counties.	Number of feet (board measure) other woods cut.	Number of cords of bark peeled.	Number of cords used as pulp wood.	Number of cords used in the manufacture of alcohol or acid.	Total number of cords of cord wood cut.	Number of feet (board measure) cut for mine props.	Number of feet (board measure) cut for railroad, trolley and mine ties.	Number of feet (board measure) cut for telegraph, telephone and trolley poles.
Adams,	458,500	139	.....	.....	750	.....	309,100	70,800
Allegheny, .....	.....	.....	.....	.....	.....	376,409	125,480	.....
Armstrong,	125,000	.....	.....	.....	.....	159,200	525,600	.....
Beaver, .....	.....	.....	.....	.....	.....	160,000	11,000	.....
Bedford,	252,500	374	201	1,500	2,331	3,111,540	1,175,833	157,100
Berks,	406,960	70	.....	.....	430	.....	394,510	25,000
Blair,	1,330,500	334	6,835	3,666	11,974	4,181,039	3,202,272	649,900
Bradford,	1,818,000	609	12	.....	4,279	467,916	1,014,712	19,200
Bucks,	295,000	54	.....	.....	1,440	.....	218,900	.....
Butler,	295,000	.....	.....	.....	15	720,300	626,200	37,500
Cambria,	3,859,602	293	1,578	84	3,217	1,698,192	755,774	.....
Cameron,	1,473,636	939	200	.....	212	.....	.....	.....
Carbon,	140,000	.....	.....	.....	75	102,740	61,220	16,000
Centre,	3,076,807	818	1,458	3,841	8,453	6,617,840	9,421,007	2,132,050
Chester, .....	.....	.....	.....	.....	600	60,000	331,800	592,500
Clarion,	356,700	.....	.....	.....	.....	45,000	1,879,190	11,000
Clearfield,	7,925,500	591	1,170	70	1,320	628,182	1,595,244	690,300
Clinton,	1,160,071	703	524	96	1,524	3,181,620	1,627,907	3,500
Columbia,	20,000	30	20	.....	20	637,430	148,410	7,500
Crawford,	2,123,000	52	.....	.....	1,019	3,751,200	609,900	57,800
Cumberland,	90,000	111	9	.....	1,170	18,000	372,560	5,000
Dauphin,	727,700	490	.....	65	305	110,000	2,294,400	22,250
Delaware, .....	.....	.....	.....	.....	.....	.....	.....	.....
Elk,	10,375,278	25,632	6,772	51,541	58,313	928,200	408,220	.....
Erie,	2,816,000	417	.....	.....	.....	.....	100,000	.....
Fayette,	1,420,875	.....	20	.....	70	2,336,133	1,597,533	28,400
Forest,	4,628,920	10,982	940	1,370	2,260	.....	987,300	350,000
Franklin,	374,000	570	20	.....	4,278	.....	749,335	.....
Fulton,	232,250	365	.....	.....	310	78,836	667,545	.....

Greene,	721,762	2,307	2,109	2,406	5,119	2,077,836	3,137,049	4,000
Huntingdon,	273,000					60,000	440,000	
Indiana,	2,564,488	2,615				762,000	1,019,944	63,500
Jefferson,	472,842	152	36	2,292	3,198	224,000	1,830,040	243,000
Junata,			160		210	53,000	10,000	
Lackawanna,					1,352		369,900	797,010
Lancaster,	212,300	4				100,000	61,250	
Lawrence,	169,240					137,360	287,822	66,800
Lebanon,				1,226	2,341	82,000	282,723	30,500
Lehigh,	40,000	60			220			
Luzerne,	820,656	2,069				1,446,290	2,054,745	40,900
Lycoming,	2,211,057	1,266	4,519	370	6,198	1,904,000	1,532,302	164,150
McKeen,	14,347,984	32,224	17,717	20,150	43,680			
Mercer,	1,240,000				20	412,000	1,506,000	
Mifflin,	465,000	225	125	1,074	1,224	49,140	1,282,810	5,600
Monroe,	859,000	380	185		1,813	4,895,655	7,925,246	182,200
Montgomery,								
Montour,	10,000						116,000	
Northampton,	197,000	44			1,350	30,000	347,802	78,800
Northumberland,	41,364	393	182	101	321	4,406,940	879,807	316,800
Perry,	198,000	641	60	5,803	6,739	2,000	4,133,464	78,000
Philadelphia,								
Pike,	363,097				482	3,690,800	7,219,852	106,700
Potter,	56,525,920	12,608		60,750	82,284		35,700	2,100
Schuylkill,	508,000	229			1,172	1,886,000	572,320	24,560
Snyder,	128,650	592	210	629	1,094	2,316,000	2,434,893	465,000
Somerset,	2,507,000	410				740,000	1,337,294	50,000
Sullivan,	7,354,081	8,121	500	5,545	7,272	333,000	228,400	
Susquehanna,	1,694,817	603			506	2,089,000	461,000	55,000
Tioga,	8,623,809	616	600		2,813	33,500	223,600	103,000
Union,	27,000	135	23	225	323	12,000	371,872	25,000
Venango,	494,858				22,059	6,956,095	6,330,510	65,250
Warren,	16,178,622	10,086	10,424	11,275		90,000	1,422,400	368,250
Washington,	622,431					532,000	2,854,640	
Wayne,	2,656,600	262	65	1,200	10,743	1,833,176	893,000	26,200
Westmoreland,	327,700	30				966,000	273,440	
Wyoming,	1,022,000	365			80	1,968,000	2,142,288	186,450
York,	202,200	177	15		1,910		656,240	27,500
	169,146,067	120,097	57,044	175,128	309,315	63,962,759	85,671,445	8,453,070

TABULATED STATEMENT OF TIMBER CUT IN PENNSYLVANIA IN 1913.

Counties.	Number of acres cut over.	Number of acres cut over to be used for farming purposes.	Number of feet (board measure)				Number of feet (board measure) yellow or other pine cut.	Number of feet (board measure) hemlock cut.	Number of feet (board measure) oak cut.	Number of feet (board measure) chestnut cut.
			white pine cut.	yellow or other pine cut.	hemlock cut.	oak cut.	chestnut cut.			
Adams,	1,461	52	445,000	144,886	345,000	1,131,000	248,000			
Allegheny,	395	10				6,133,000	434,000			
Armstrong,	165					1,343,867	40,000			
Beaver,	2,314	309	985,500	309,468		3,457,885	520,000			
Bedford,	423	27	500	300		1,165,817	449,287			
Berks,	1,951	157	179,360	12,500	105,000	1,002,002	384,000			
Blair,	809	44	423,000	37,000	1,392,600	123,000	21,000			
Bradford,	52					135,000	22,300			
Bucks,	245	15				767,829	150,000			
Butler,	1,714	146	1,150,500		422,734	157,114	619,289			
Cambridge,	456		3,000		572,150	18,000	20,000			
Cameron,	90		12,200		216,000	5,700				
Carbon,	10,607	162	2,363,683	928,168	1,602,310	5,913,724	3,585,800			
Centre,	411					248,000	117,000			
Chester,	913	138	60,000	30,000	91,000	3,930,414	1,205,000			
Clarion,	5,434	1,043	2,683,500	674,144	5,774,000	1,378,600	738,206			
Clearfield,	3,389	112	1,663,583	596,187	1,064,246	834,065	646,749			
Columbia,	720	46	279,800	10,000	655,000	34,390	366,000			
Crawford,	568	57	37,000		349,000	424,000	173,100			
Cumberland,	352	5	180,000	210,000	15,000	210,000	10,000			
Dauphin,	1,375	41	763,190	196,000	320,000	1,674,578	1,890,000			
Delaware,										
Elk,	5,670	41	367,000	65,000	72,026,800	129,000	112,800			
Erie,	521	359	233,000		1,091,000	264,500	255,200			
Fayette,	1,420	139				3,774,901	1,805,981			
Forest,	3,137		6,876,920	725,000	30,297,395	3,007,768	793,000			
Franklin,	694	72	175,000	155,000	25,000	1,345,443	493,365			
Fulton,		106	642,600	580,000	10,000	856,000	251,000			

TABULATED STATEMENT OF TIMBER CUT IN PENNSYLVANIA IN 1913.—Continued.

Counties.	Number of cords of						
	Number of cords of bark peeled.	Number of cords used as pulp wood.	Number of cords used in the manufacture of alcohol or acid.	Total number of cords of cord wood cut.	Number of feet (board measure) cut for mine props.	Number of feet (board measure) cut for railroad ties.	Number of feet (board measure) cut for telegraph poles.
Adams,	173	.....	.....	1,220	36,000	376,244	17,950
Allegheny,	1,180,000	386,000	.....
Armstrong,	110,000	39,820	.....
Beaver,	2,856,401	3,073,488	10,300
Bedford,	946,000	1,209,488	294,300
Berks,	2,941,800	3,949,498	135,800
Blair,	480,000	385,488	5,000
Bradford,	1,580,764	83,932	5,000
Bucks,	7,167,263	460,651	75,000
Butler,	116,000	7,549,410	178,000
Cambria,	3,331,460	301,000	5,000
Cameron,	10,197,618	64,198
Carbon,	937,768	994,400
Centre,	611,200	45,000
Chester,	2,875,416	85,300
Clarion,	3,744,358	.....
Clearfield,	376,735	.....
Clinton,	987,826	.....
Columbia,	224,600	44,000
Crawford,	67,000	.....
Cumberland,	4,723,000	36,500
Dauphin,
Delaware,
Elk,
Erie,
Fayette,
Forest,
Franklin,
Fulton,

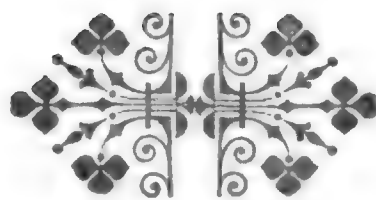
State	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000
Alabama	5,000	5,304	7,616	48,000	10,484	3,555,812	6,216,856	98,240			
Alaska	1,597,850					300,000	154,400	3,000			
Arizona	865,000					292,000	263,680	22,200			
Arkansas	1,131,502					2,000,000	2,254,150				
California	1,074,000		4,566			44,000	36,000				
Colorado	963,000					70,000	686,750				
Connecticut	84,280					18,000	30,000				
Delaware	30,000					608,000	1,458,632				
District of Columbia	80,000					175	288,000				
Florida	65,000					3,045,919	2,500,660				
Georgia	1,555,628		8,676			1,861,000	1,523,904				
Idaho	8,477,079		16,892			8,900	1,200				
Illinois	14,336,000		50,687			929,171	416,560				
Indiana	464,000					685,000	1,302,164				
Iowa	388,250		1,629			2,711,200	5,365,679				
Kansas	500,067										
Kentucky											
Louisiana											
Maine											
Maryland											
Massachusetts											
Michigan											
Minnesota											
Mississippi											
Missouri											
Montana											
Nebraska											
Nevada											
New Hampshire											
New Jersey											
New Mexico											
New York											
North Carolina											
North Dakota											
Ohio											
Oklahoma											
Oregon											
Pennsylvania											
Rhode Island											
South Carolina											
South Dakota											
Tennessee											
Texas											
Utah											
Vermont											
Virginia											
Washington											
West Virginia											
Wisconsin											
Wyoming											
Total	145,809,268	141,022	281,911	75,842	382,065	75,060,293	91,989,729	5,448,668			

Rank	Name	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	Total
31.	Lebanon,	55	10	2,000	50	10	170	68	181 28	2,031 49	3,993 31	51 10	110 00
32.	Ichigb,	10											50 00
33.	Luzerne,	1,551		2,000	50	10							5,143 00
34.	Lycoming,	1,749	40	75,000	40	10		330	2,031 49	3,993 31	51 10		9,518 50
35.	McKean,	2,154					170						12,290 00
36.	Midlin,	5,498											28,841 00
37.	Monroe,	1,044		10,000	34				51 10	54 75	29		6,154 00
38.	Northampton,	76											410 00
39.	Northumberland,	130		6,500					5 00				1,450 00
40.	Perry,	268		40					26 80				665 50
41.	Pike,	2,970			200				322 00				9,896 00
42.	Potter,	7,581		130,000		500			2,231 41				24,149 00
43.	Schuylkill,	10,334		43		505	4		1,025				23,976 00
44.	Snyder,	1,300							45 37				1,115 00
45.	Somerset,	447							14 80				1,542 00
46.	Sullivan,	339		15,000					397 25				3,227 00
47.	Tioga,	3,441		100,000		1			661 78				7,602 00
48.	Union,	7,997							1 35				5,493 00
49.	Warren,	2,765		1,015,000			200		800 75				23,146 00
50.	Wayne,	650							8 00				2,282 00
51.	Westmoreland,	2,651					10		235 00				11,619 00
52.	Wyoming,	535		12,500					50 80				7,432 00
53.	York,	30				5			8 75				197 00
		142,305		2,782,000		4,717	1,779	786	\$22,249 15				\$430,222 50
					8,552			30	\$10,555 00		2,913	552	745

142,346 acres reported burned over at a total loss of \$430,222.50, or an average loss of \$3.02 2/7 per acre.
2,685 acres average per County.
191 acres average per fire.

NUMBER AND CAUSES OF FOREST FIRES DURING THE YEAR 1913.

Unknown,	368
Railroads,	164
Burning brush,	78
Incendiary,	48
Saw mills,	32
Painters, fishermen and berry pickers,	29
Lightning,	8
Children and tramps,	6
Back-firing,	4
Toy balloons and burning buildings,	4
Carelessness,	4
Smoking out animals,	3
Dynamite blasting,	3
Automobile,	1
Total,	745



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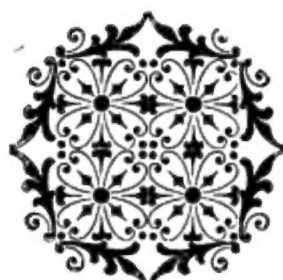
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